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A NEW GENUS OF TWO PREVIOUSLY DESCRIBED AND TWO NEW SPECIES OF THE FAMILY EURYTOMIDAE BRED FROM CYNIPID AND DIPTEROUS HOSTS

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The four species discussed in this paper are closely related but easily separated on the basis of the characteristics noted under each one. They display a number of structural features that depart from the usual conformity that characterizes the genus *Eurytoma*.

These characteristics are distinct enough to set this group of species apart from others of the genus and are not mentioned in any keys (e.g. Ashmead, 1904) nor in the original description of *Tenuipetiolus=(Eurytoma) albipes*, Ashmead, 1881).

The parapsidal grooves are indicated clearly anteriorly only and become faint posteriorly. The abdominal petiole is long, and may be twice the length of the hind coxae in the female especially. The first (really third) abdominal segment is fused dorsally with the second (fourth) and is discerned as a separate segment latero-ventrally only. The propodeum forms a right angle with the posterior tip of the scutellum and the sculpturing of the depressed propodeum is quite different from most members of the genus *Eurytoma*.

There are other characters that might be mentioned but enough have been suggested to delimit this group of species as a new genus of the family *Eurytomidae*, tribe *Eurytomini*.

Tenuipetiolus n. gen.

Genotype, *Tenuipetiolus (=Eurytoma) albipes* (Ashmead)

Female. Black. Aver. in length from 2 mm. to 2.8 mm. (range 1.7-3.7) Abdomen plump; triangular in shape from a lateral view with the apex pointing posteriorly; petiole is always longer and may be twice as long as hind coxae and arises from the anterior ventral part of abdomen; anterior dorsal margin of abdomen arches upward at a right angle to petiole and then slopes sharply posteriorly; third abdominal segment (first posterior to petiole) fused dorsally with the fourth segment but differentiated as a separate segment latero-ventrally; sixth segment wide, often covering the seventh and eighth segments dorsally; fine pitting on lateral surface of the sixth segment is limited to anterior-ventral quarter; rest of surface smooth; 9th segment (end of dorsal valves) short and broad; aver. .10-.12 mm. in length (range .07-.17). Internal genitalia moderately to only slightly extended dorsally, anteriorly, so that stylet arch is in an oblique to horizontal plane; dorsal valves stout and broad for horizontal length with a noticeable concavity just anterior to exposed tips; genitalia range in length from 1.2-1.5 mm. (aver. 1.3); height from .67-1.0 mm. (aver. .82). Thorax with the propodeum at right angles to the scutellum; propodeum only slightly depressed and surface finely and evenly punctate with no evidence of a central furrow; parapsidal grooves of

the mesonotum faint or invisible posteriorly but clearly indicated anteriorly; pronotum narrow and rectangular in shape from above or about two-thirds the width of the mesonotum. Antennae short and stocky; subclavate; segments of the funicle most often almost square or equal in length and breadth except first segment which may be longer than wide; terminal segments may be slightly swollen club. Wing veins yellow to light brown; marginal thin and may be equal to or longer than the postmarginal.

Male. Black. Aver. in length 1.5-2.1 mm. (range 1.3-2.6). Antennae with the flagellum 6 segmented; first segment longer than wide and covered with long hairs; second segment short and humped with two whorls of long hairs; third and fourth segments triangular in shape, each with one whorl of long hairs; fifth segment barrel shaped with one whorl of hairs; sixth segment bluntly pointed and composed of two closely fused segments; segments 1-5 separated by long pedicles. Relation of the length of the marginal and postmarginal veins varies as in the female.

Hosts. Cynipid gall makers on rose and blackberry and cecidomyid species on a variety of plants.

Range. Probably all of North America and Mexico but actually recorded so far from eastern and southwestern United States and one locality in southern Mexico.

Remarks. There are at least two other species in the genus *Eurytoma* that have elongate abdominal petioles in the female, i.e. *E. lycti* Ashmead and *E. phloeotribi* Ashmead. Types of both species were compared with *Tenuipetiolus (=Eurytoma) albipes*. Actually *Eurytoma lycti* and *E. phloeotribi* are more like each other in their morphology than they are to *albipes* and do not display any of the other characteristics noted in the generic description that would connect them closely with the new genus.

A key to the four known species of the new genus follows.

Key to the Species of the genus *Tenuipetiolus* Based on Females Only

Abdominal petiole longer than the hind coxae; 3rd segment of the abdomen (first following the petiole) fused dorsally with the 4th; depressed area of propodeum finely and uniformly punctate; parasidal grooves incomplete or very faint posteriorly; abdomen triangular in shape from the side with the wide 6th segment covering the 7th dorsally and often the 8th. *Tenuipetiolus* n. gen.

A. Scape of antennae and all femurs and tibiae, except apices, black to brownish black. All funicle joints subquadrate and equal in length.

B. Marginal and postmarginal veins approximately equal in length; females aver. 3.1 mm. in length (range 2.4-3.5) ..... 1. *T. albipes* (Ashmead)

BB. Marginal longer than postmarginal vein, aver. 1.5 times the length of postmarginal; females aver. 2.1 mm. in length (range 1.7-2.6). ..... 2. *T. mentha* n. sp.

AA. Scape of antennae and fore-tibiae always, and sometimes mid and

hind-tibiae yellowish-brown; funicle 5 jointed, the joints, except the first, subquadrate; first joint slightly longer than broad.

B. Marginal and postmarginal veins approximately equal in length; flagellum of antennae with slightly swollen club; color brownish-yellow; females aver. 2 mm. in length. ..... 3. *T. medicaginis* (Gahan)

BB. Marginal longer than postmarginal vein, aver. 1.7 times length of postmarginal; flagellum of antennae black; no noticeable club; females aver. 2.8 mm. in length (range 2.0-3.7) ..... 4. *T. rubra* n. sp.

Tenuipetiolus albipes (Ashmead)

Eurytoma albipes 1881. Ashmead, Trans. Amer. Ent. Soc., (Ent. Sec.) 9: XXXI; Dalla Torre, 1898, Cat. Hymen. 1-598; Breland, 1939. Ann. Ent. Soc. Amer., 32 (4): 719-726.

This species was described, quite inadequately, by Ashmead in 1881 from two specimens, a female and male, "captured at large," in Jacksonville, Florida. Only the female type is now available in the U. S. Nat. Mus. collection and it lacks the gaster, as well as the scape of the antennae.

Some additional specimens have been added to my own and to the Nat. Mus. collections in recent years which seem to agree fairly well with the type of *albipes*. The localities and other data for these specimens are listed below:

Texas: *Austin;* collected Sept. 9 and 14, 1938, females emerged Sept. 10-22, 1938 from galls on sunflower seeds made by *Asphondylia globulus,* Breland coll., Gahan det., 7 females and 1 male. *Dallas;* collected on October 27 and November 26, 1906; emerged March 11 and December 24, 1906 from *Ambrosia psilostachya* stem, R. A. Cushman coll., Bugbee det., Hunter 1319. 2g and 1319. 4g., 2 females. *Navasota;* May, 1935, L. H. Hitchcock coll., emerged from cecidomyid gall on *Xanthuim*, 5 females. **Mississippi**: Columbus; collected August 10 and 15, 1938; emerged August 18 and 27, 1938 from *Asphondylia globulus* in sunflower seeds, Breland coll., Bugbee det., 4 females. **Kansas**: *Riley County*; collected September 25 and 30; no year given; E. E. Faville coll., Bugbee det., 2 females.

Although the number of specimens, locality, and host records of *albipes* is small it would seem that the species is most apt to be found through the southern tier of states, bordering the gulf of Mexico and that species of the dipterous family, *Cecidomyidae* serve as hosts. More extensive collections of this species may enlarge its range and host choices. The two females from eastern Kansas do not have a host designated, but they suggest a wider range for the species than indicated above.

Tenuipetiolus rubra n. sp.

Plate I, Figs. 1, 2, and 3; Map I.

Female. Black. Length 2.0-3.7 mm. (aver. 2.8). Abdomen triangular in shape, as seen from the side; aver. 1.4 mm. in length (range 1.2-1.8); 6th segment wide often covering completely segments 7 and 8 dorsally; width varies from .57-.75 mm. (aver. .64); sculpturing, in the form of fine scaling, is con-

fined to anterior lower ⅓ or less of the lateral surface of segment six so that most of the lateral and dorsal surface is smooth and shiny; 9th abdominal segment short and stubby; in line or projecting below the horizontal axis of the abdomen; aver. .12 mm. in length (range .10-.17). Internal genitalia short and with only moderate dorsal extension anteriorly; dorsal valves broad for horizontal length with a deep notch or concavity just in back of, or anterior to exposed ends of valves (9th abdominal segment); extent of black color of dorsal valves varies but always fades out completely anteriorly or before anterior end of dorsal valves bend slightly dorsally; spiracle round, small and close to ventral edge of exposed end; dorsal extension anteriorly, moderate so that stylet arch is near a horizontal plane; total length of genitalia aver. 1.5 mm. (range 1.3-1.7); height aver. .83 mm. (range .75-.90) and anterior expanded plate of ventral valves aver. .16 mm. (range .10-.20) at widest point. Petiole aver. .62 mm. in length with upper surface shagreened; longitudinal ridges sometimes indicated towards posterior end and along lateral surface. Propodeum slightly depressed; no median furrow; depressed area with the surface finely punctate; length of this area greater than its width; in upper third, lateral carineae and a very short central carina are indicated; central and lateral carineae outline two dome shaped areas representing top of depression. Tegulae deep reddish brown to black; never yellow. Parapsidal grooves on the mesonotum indicated anteriorly but very faint, if not entirely invisible posteriorly. Antennae with the outer face of scape most often yellowish-brown; less often with the upper tip black; flagellum most often black, less often with a slight yellowish tinge; flagellum 7 segmented; first segment longer than wide; succeeding units become progressively shorter so that segment 5 and 6 are approximately equal in length and width; segment 6 is fused with segment 7 to form a slightly swollen club. Legs with black on the femurs only; apices yellowish-brown; tibiae yellowish to reddish-brown; hind tibiae may be dark brown to black medially with apices yellowish-brown in a few specimens. Wing veins yellow to very light brown; marginal vein thin or only a little wider than postmarginal; stigmal club small and rectangular in shape; marginal aver. .34 mm. (range .27-.42) in length and the postmarginal aver. .20 mm. (range .17-.27); thus the marginal is always longer than the postmarginal by, on the average 1.7 times the length of the postmarginal.

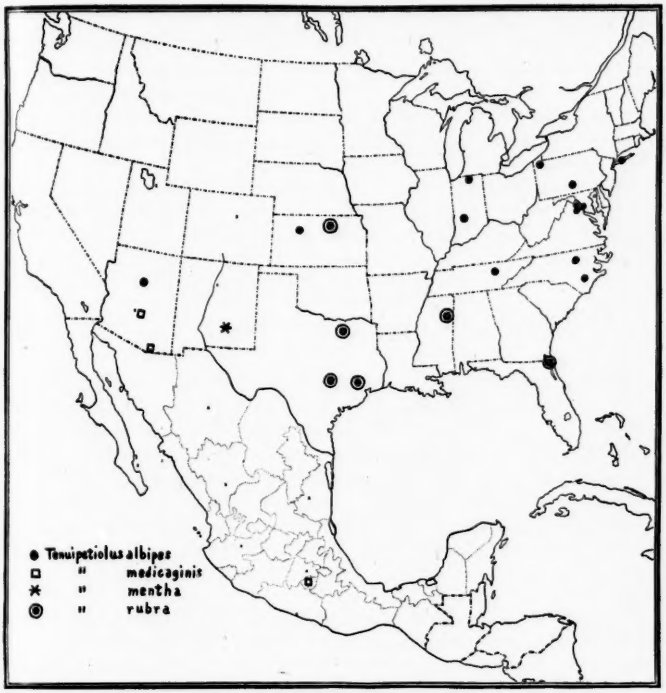
Male. Black. Aver. in length 2.1 mm. (range 1.4-2.6). Scape black and most often black infuscation on femurs and tibiae of all legs; less often fore-tibiae yellowish-brown. Antennae with the flagellum 6 jointed; the first segment longer than wide and covered by whorls of long hairs. Wing veins brown; marginal aver. .30 mm. in length (range .27-.35) and the postmarginal aver. .21 mm. (range .15-.27).

Types. 32 females and 13 males. Holotype female, allotype male and paratypes of both sexes in the Bugbee coll. and paratypes of both sexes in the U. S. Nat. Mus.

Type locality. Bloomington, Indiana. Galls collected in March, April, and December 1932, 33 and 35; males and females emerged May 3 through 30, 1933 and 1935.

Host. Bred from galls of *Diplolepis rosae.* Bugbee coll. and det. on Rose (*Rosa* sp.); *Diastrophus nebulosus,* Kinsey coll. and det.

Additional localities and hosts. **Indiana**: *Granger;* collected Dec. 3, 1927, males and females emerged May 20 and June 10, 1928 from *Diastrophus nebulosus* on *Rubus* sp., Kinsey coll. and det., 11 females and 1 male. **Pennsylvania:** *Meadville;* galls collected on April 29, 1948, males and females emerged May 14, 1948 from *Diastrophus cuscutoeformis* on *Rubus,* Muir coll. and Bugbee det. 11 females and 4 males; *Carlisle;* galls collected on April 4, 1947, females emerged May 2, 1947 from *D. nebulosus* on *Rubus,* Bishop coll., and Bugbee det., 7 females. **New York**: *Centereach;* L. I., collected sweeping flowers on Sept. 1, 1934 by F. S. Blanton, 1 female and 2 males; *Selden, L. I.,* collected sweeping flowers on Sept. 1, 1934, by F. S. Blanton, 3 females. **Virginia:** *Minor Hill-Falls* church; males and females reared from *D. nebulosus* on *Rubus* March 31, April 14, 15, 22, and May 10, 1913, Wm. Middleton coll., 11332, Hopk. U. S., 7 females and 8 males; *Fairfax County;* May 12, 1911, parasite of *D. nebulosus,* R. A. Cushman coll., Quaintance No.



MAP I

Locality records for the four species of the new genus *Tenuipetiolus.*

7110, 2 females; *Vienna;* May 14, 1911, parasite of *D. nebulosus,* R. A. Cushman coll., Quaintance No. 7115, 1 female; *Alexandria;* emerged April 17, 1920, bred from Blackberry; W. Reynolds coll., 1 female. **North Carolina**: *Willard;* collected October 7, 1934, F. S. Blanton coll., 1 female; *Wake Forest;* from gall of *D. nebulosus,* J. D. Ives coll., **Tennessee:** *Oakdale;* galls collected on November 5, 1928, female emerged June 10, 1929 from *D. nebulosus* on *Rubus,* Kinsey coll. and det., 1 female. **Kansas:** *Hays;* galls collected November 18, 1941, female emerged May 13, 1942 from *Diplolepis* species on *Rosa.* Bugbee coll. and det., 1 female; **Arizona**: *Flagstaff;* reared April 29, 1918 from *Diplolepis rosaelobis* (?) on *Rosa,* L. H. Weld coll., Hopk. U. S. 15600b, 4 females and 1 male.

Range. Tenuipetiolus rubra probably will be found to range over the entire United States east of the Rockies and into the Great Basin region wherever rose and blackberry occur (Map No. 1)

Remarks. By means of its larger size, the slightly depressed, longer than wide, propodeal configuration, the reddish yellow scape and fore-tibiae and the longer marginal vein in relation to the marginal, *T. rubra* can be separated from the other three species making up the genus.

The species is bred from galls of *Diastrophus nebulosus* and *D. cuscutoeformis* on blackberry and *Diplolepis rosae* on wild rose species.

Many specimens have been cut from chambers in the galls as larvae and raised to adults in small vials. In all cases the larvae were the only occupants of the chamber which suggests that they must act as primary parasites of the host cynipid.

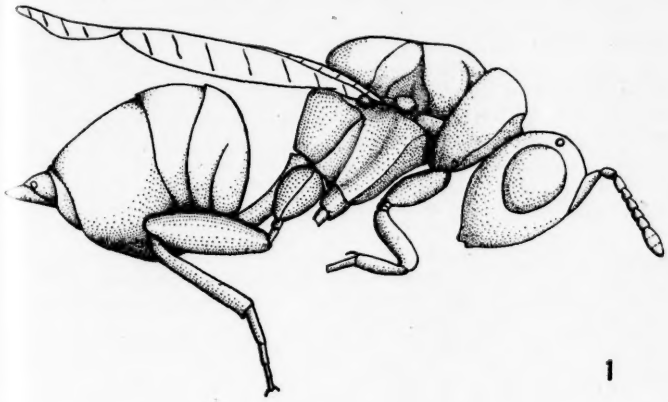
The females seem to outnumber the males by a ratio of 3 to 1. Counting all the specimens of this species used in this study there were 83 females and only 29 males. The bulk of emergence occurs in May with a few carrying over into early June.

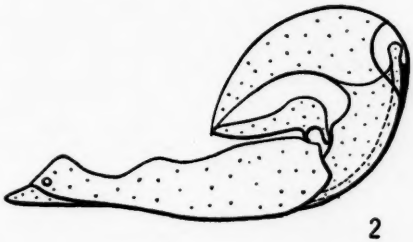
Tenuipetiolus medicaginis (Gahan)

Eurytoma medicaginis, Gahan, A. B. 1919. Ann. Ent. Soc. Amer., 12 (2): 159-161 Map I.

This species has been adequately described by Gahan and there is a good series of both males and females in the U. S. Nat. Mus. The original type series from Tempe, Arizona has been supplemented by one female specimen from Nogales, Arizona, number 68019, collected August 4, 1948 by Lindsay and Callaghan. It was bred from a dipteron in pods of *Mentzelia* species. Also two females and 1 male collected on April 18, 1917 by E. A. McGregor and determined as *medicaginis* by Muesebeck are indicated as "parasites on a desert shrub species". No locality is given on the labels, but it is assumed that they were taken in the vicinity of Whittier, California where McGregor was employed at the time.

A single female specimen from Cuernavaca, Morelia, Mexico, bred from a leaf gall on *Lantana involucrata* and collected May 19, 1945 by N. L. H. Krauss is placed provisionally under this species. It differs from *medicaginis,* as well as the other species in having all yellow legs including the distal end of the front coxae and yellow tegulae. It probably represents a new species but one lone specimen is not enough to base any definite conclusion on.





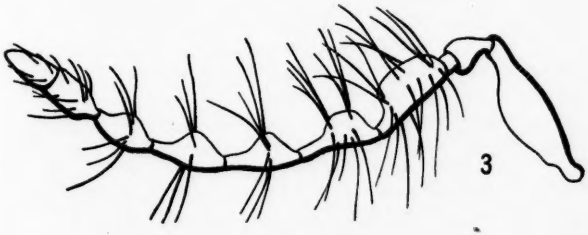


PLATE I

Fig. 1 Female of *Tenuipetiolus rubra* n. sp. 54X

Fig. 2 Female genitalia of *T. rubra* n. sp. For drawing of genitalia insect enlarged to 100 mm.

Fig. 3 Antenna of male of *T. rubra* n. sp. For drawing of antenna insect enlarged to 175 mm.

The range of this species seems to be southern Arizona. It probably also will be found to occur in New Mexico and Old Mexico.

This species may be told from *T. albipes* by the lighter colored scape, flagellum, tibiae and tegulae, and the less heavily sculptured thorax. It can be told from *T. rubra* by the approximately equal length of the marginal and postmarginal veins, the almost square shape of the finely punctate, depressed area of the propodeum, the yellowish-brown color of the tibiae and scape, and the approximately square basal joints of the funicle. The same general features separate it from *T. mentha* n. sp.

Tenuipetiolus mentha n. sp.

Map I.

Female. Black. Length aver. 2.1 mm. (range 1.7-2.6). Abdomen plump and triangular in outline from a lateral view, with the apex pointing posteriorly; aver. 1.0 mm. in length (range .90-1.2); width of 6th segment aver. .43 mm. (range .40-.50) at its widest part; 9th segment short and broad, averaging .10 mm. (range .07-.12 mm.) in length. Internal genitalia short and with little dorsal extension anteriorly; dorsal valves broad for anterior three-quarters of length; narrowing posteriorly to about half the broadest width; aver. 1.2 mm. in length, .67 mm. in height and expanded dorsally projecting plate of ventral valves aver. .10 mm. at widest point; stylet arch is in a horizontal plane. Petiole about twice the length of hind coxae and arising from the anterior ventral surface of the abdomen. Propodeum at a right angle to the thorax; surface only slightly depressed and finely and evenly punctured; depressed surface wide, especially towards base so that area appears almost square or length only slightly greater than width. Thorax with the tegulae black; parapsidal grooves on the mesonotum complete but faint posteriorly. Antennae including the scape all black; pedicle and first segment of flagellum about same length; all segments of the flagellum approximately square, i.e. equal in length and width; distal three fused closely together, forming a slightly swollen club. Legs with black infuscation on all femurs and tibiae; tips yellowish-brown. Wing veins yellow; marginal thin, averaging .21 mm. in length (range .20-.22); postmarginal always shorter than marginal and aver. .15 mm. in length; thus marginal averages about 1.4 times the length of the postmarginal.

Male. Black. Aver. 1.5 mm. (range 1.3-2.0) in length. Antennae including scape black; flagellum 6 segmented; first segment at least twice as long as the pedicle and covered with long hairs; succeeding segments shorter and more triangular shaped with 2 whorls of long hairs on the second and one whorl on segments 3, 4, and 5; pointed terminal unit consists of two closely fused segments; segments 1 through 5 separated from each other by long thin pedicles which arise from lower half of segment.

Types. 7 females and 27 males. Holotype female and allotype male in Bugbee coll., Meadville, Pa. Paratypes of both sexes in the U.S. Nat. Mus., Washington, D.C.

Type locality. White sands National Monument, Alamogordo, New Mexico. Collected June 23, 1940. Many males and females had already emerged and

were collected on the wing while others emerged from the seed pods on June 26, 1940 and July 10, 1940. Bugbee coll.

Host. Believed to be a small dipteron, probably a cecidomyid, which occurs in the seed pods of a mint, *Poliomintha incana,* Emerson det.

Range. Known only from the White Sands National Monument, a 274 square mile tract of granulated gypsum sand in south central New Mexico. The range of the host mint (*P. incana*), however, is quite extensive. It is listed as "growing in the creosote bush and grass zones of West Texas to southern Utah, Northern Arizona and south to Mexico" (letter from F. W. Emerson). Further collections may extend the range of *T. mentha* over a part or all of this area.

Remarks. This species occurs in a unique habitat. It was collected on the wing and also bred from the seed pods of a mint species. From the same pods issued a small dipteron on which *T. mentha* is suspected of being parasitic.

An examination of the types of *Tenuipetiolus albipes* and *T. medicaginis* in the U.S. Nat. Mus. collection demonstrated that the specimens from New Mexico were different from either of them. The new species may be told from *T. albipes* and *T. rubra* by its much smaller size, which is expressed also in all other measurements i.e. length of the 6th and 9th abdominal segments, and the length of the marginal and postmarginal veins. In addition the wider and almost square shape of the depressed propodeum is an easily discernable characteristic. It differs from *T. medicaginis* in the black scape and antennae, the presence of black infuscation on all femurs and tibiae of the legs, the black or dark brown tegulae, the short postmarginal vein in relation to the length of the marginal, and the different shape of the propodeum. In the latter case the propodeum of *T. medicaginis* is broader than long and flat across the top while in *T. mentha* it is square or only slightly longer than broad and convexly rounded across the top.

T. mentha seems to be most closely related to *T. medicaginis,* as they average about the same in size. The propodeal configuration of both are more similar to each other than to *T. rubra* or *T. albipes* and they occur in neighboring territory.

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OBSERVATIONS ON THE NESTING HABITS OF MEGACHILID BEES[1]

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The nesting habits of only a few specific representatives of the Megachilidae are now well known. This lack of fundamental biological data is perhaps the result of the large number of species in the family, their widespread distribution throughout many varied ecological zones, and the seeming rarity of certain species. Biological observations on the nesting habits of three species of the genus Dianthidium and a single species of Megachile are recorded below. It is hoped that this information may add another paving block in the long road to understanding the biology of North American bees.

DIANTHIDIUM CONCINNUM (Cresson)

Hungerford and Williams (1912) have described several bee nests which they doubtfully ascribed to *Dianthidium concinnum*. A similar nest in the collection of Kansas State College together with the bees which emerged from it verify the supposition of Hungerford and Williams.

This nest of *Dianthidium concinnum* (Cresson) [det. H. F. Schwarz] was collected by Jesse Pratt at Studley, Kansas, on a branch of a dead Chinese Elm on August 7, 1941. The nest (Figures 1 and 2) consists of ten complete cells and a portion of another arranged along the main axis of the twig. The cells are situated at an angle to the stem so that the bottom of each cell is somewhat elevated with respect to the true top of the cell.

The entire nest measures 65 cm. in length, the individual cells averaging 12 mm. in length with a diameter of 5 mm. being more or less ovoid in shape. All of the cells are composed of small stones or pebbles glued together with plant resins, and are so arranged that the side walls of one form the wall of the cell above it. According to notes taken by Prof. George A. Dean, emergence began with the insect in the lower cell and progressed upward over a period of nine days. This would seem to indicate that the artisan began work at the fork of the twig and worked progressively upward, presumably covering a like number of days to complete the manufacture of the nest, provision the cells, lay an egg in each, and seal the top of each cell.

The mammillary projection on the pupa case, characteristic of species of the subfamily Anthidiinae, was present. The mammilla was very small, rather blunt, and somewhat rounded as compared with the erect spine-like mammilla found on the pupa case of *D. sayi*. A small air space above the pupa case, as found in the cells of other members of the genus, was also found, but it too was very small.

DIANTHIDIUM SIMILE (Cresson)

Two females of this species have been reared from a partly rotted log at E. Lansing, Michigan. Unfortunately, a search of the log revealed nothing of

[1] Contribution No. 583 from the Department of Entomology, Kansas State College.

the cells. Since the log was well traversed by beetle and termite galleries, it seems probable that the cells may have been located in an abandoned burrow.

DIANTHIDIUM SAYI Cockerell

The nesting habits of this bee have been noted on two previous occasions. Hicks (1926) describes the nature of the cell as well as their position in the soil in Colorado. Returning to this same area the following year Custer and Hicks (1927) continued their studies and recorded considerable biological data. They describe several instances in which a single female worked alternately in the construction of two nests, and recorded their observations on the use of resin from the leaves and stems of *Helianthus petiolaris* in the construction of the bee cells. However, neither paper gives much information on the internal organization of the nests which were found on hillsides in sandy soils.

The aggregation of *Dianthidium sayi* Cockerell [det. H. F. Schwarz] reported here was discovered at Garden City, Kansas, on August 11, 1949, in a vertical bank of a gravel quarry. The nest occupied approximately a square yard of the bank and faced in a southeasterly direction. Many openings were observed into the interior of the nest but they appeared to be communal in nature, for several females were seen to enter a common burrow without molestation on the part of the other members of the group. Digging into the bank revealed that the tunnels seemed to ramify without any set pattern. Usually, however, each burrow first led to a small chamber from which further tunnels were given off. These secondary tunnels contained from one to several cells grouped together in a small clump. Apparently, each of the females entering the communal entry had one or more of the secondary tunnels in which they were working. A somewhat similar chamber is described by MacSwain (1946) for the nest of *Heteranthidium larreae* (Cockerell) in which "the vasiform cells . . . radiated out from the main cavity as numerous fingers". There is a definite possibility of the existence of a low level of colonial formation if various females work together as a unit in the construction of the various burrows as well as the cells in the secondary tunnels. However, this is merely a matter of speculation at the moment, for no observations have been made which would indicate that this bee exhibits even a semblance of mutual assistance, other than its gregarious habit of living together and the formation of large communities.

As far as the selection of a nesting site is concerned, *Dianthidium sayi* seems to be an anomalous member of the genus. Other members of the genus Dianthidium whose biology is known construct their nests on the surface or in depressions of rocks, or on twigs, and doubtless in other similar situations. As pointed out by Custer and Hicks (1927) this is the only known member of the genus which nests in the soil. However, the basic materials used in nest construction remain the same as those used by other members of the genus—pebbles or grains of sand held together by plant resins. From the phylogenetic viewpoint the materials employed in the construction of the cell appear to be of a more fundamental nature than is the site selected for the nest.

The cells in this instance were formed entirely of pebbles and small stones

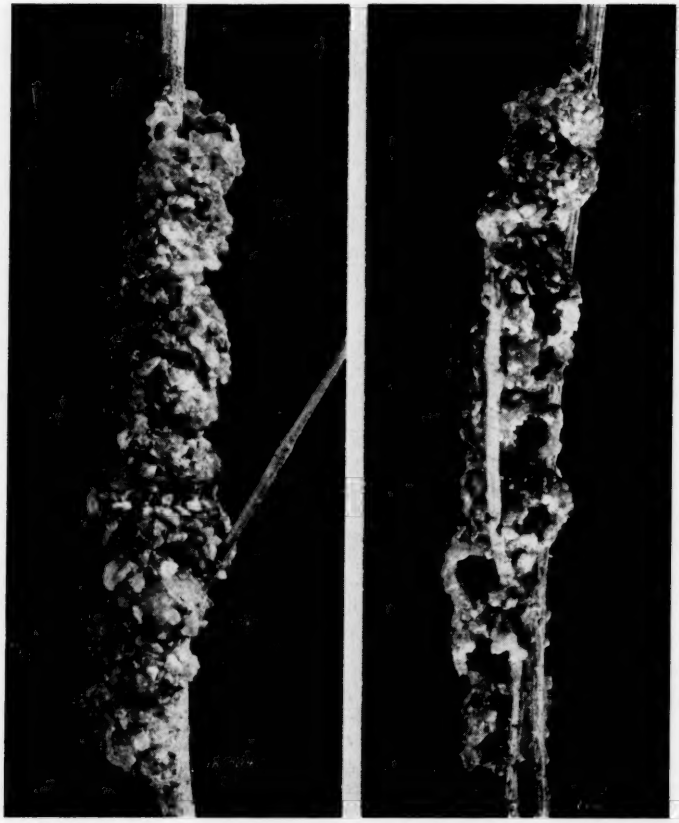

Figure 1. Nest of *Dianthidium concinnum* (Cresson) before emergence of the bees.
Figure 2. Nest of *Dianthidium concinnum* (Cresson) after emergence of the bees.

held together by plant resins, and were free of the miscellaneous frass which was incorporated into the construction of cells observed by Custer and Hicks (1927). The greater availability of materials of stones and pebbles in this case perhaps made unnecessary the use of these additional materials in the manufacture of the cells.

A portion of the nest was collected and brought back to the laboratory to determine the incidence of parasitism. From this material 16 males and 34 females of the bee emerged in the period between August 14 and September 10. In July and August of the following year (1950) two additional males

and three females emerged. The emergence of adults in 1949 and again in the summer of 1950 indicates that the nest is of several years' standing and that the aggregation is not built up within the period of a single year. However, at the time of this writing, a few cells still contain viable larvae. Could this not, then, be another case of a bee requiring two or more years to reach maturation? Davidson (1896) had previously pointed out such a phenomenon in the case of the related *Dianthidium consimile* (Ashmead) in which he found individuals which must have been in the cell for nearly three years before emergence. He states that "instances of bees remaining for more than one season in the larval state are probably not so very rare. It seems reasonable to suppose that those species inhabiting such arid districts as Palm Springs [California] must have some such natural provision to preserve them from extinction, as it frequently happens that in two successive seasons absolutely no rain falls, and food must, of necessity be very limited". Why individuals of *sayi* must carry over in the larval state for two successive seasons in Kansas, which normally experiences adequate quantities of rainfall to sustain plant growth, is an unanswered question. Apparently Custer and Hicks in their study on the biology of this species under Colorado conditions made no observations in this regard, for they make no mention of any facts which may help to clarify this point.

Parasites which were reared from these cells include eleven males and three females of the mutillid, *Sphaerophthalma uro* ssp. *melanderi* (Baker) [det. R. M. Schuster] and a single female of the mutillid *Dasymutilla harmonia* (Fox) [det. C. E. Mickel]. Nearly one-fourth of the insects reared from the cells were parasites, which is in marked contrast with the work of Custer and Hicks who came to the conclusion that this bee "seems to be nearly free from parasitism". In the collection of Kansas State College are four specimens of the wasp *Eusapyga rubripes* Cresson [det. R. Bohart] which were reared by Dr. R. H. Painter from a similar nest found in 1929 in Seward Co., Kansas. From this same aggregation, twenty Bombyliid flies belonging to an apparently undescribed species of Anthrax were also reared.

The fact that the mutillid parasites have emerged only from cells in which the pupal case with the characteristic mammillary projection was formed, indicates that they are primary parasites of the late larval or pupal stages of the bee. Characteristically, emergence of the mutillids is invariably from the side of the cell, whereas the mature bee usually gains its exit from the end of the cell by chewing through the mammillate parchment-like roof of the pupal case and thence through the end of the cell. In a few instances, bees have been noted which, failing to chew their way through the end of the cell, have attempted to extricate themselves through the side walls. Such a futile expenditure of their energy resulted in the death of the individual.

MEGACHILE (ARGYROPILE) PARALLELA Smith

A female of this species was observed to enter a burrow in a fallow field on July 16, 1949, at Leavenworth, Kansas. The nest entrance was partially concealed by a small clump of earth. The burrow extended into the earth for about two inches at an angle of 45°. At the end of the burrow and parallel with the surface of the ground was found a single cell. While the nest was

not completed, the facts that the cell was found parallel with the surface of the ground and that the tunnel angled immediately to the surface from the cell, lend credence to the idea that the nest would have been completed with but a single cell.

The cell was composed of fifteen entire leaves of the common landscape shrub, *Spirea vanhoutteii*, and five leaflets of white clover, *Trifolium repens*. These leaves and leaflets were intermingled in the construction of the side and end walls of the cell. The cell was virtually complete and probably ready for egg deposition, for a copious supply of pollen was found filling the bottom third of the cell.

The cell constructed by this bee is unusual in that entire leaves or leaflets are used in its manufacture, rather than the circular areas which are cut out from leaves and commonly used by many species of Megachile. The use of entire leaves or leaflets which may be snipped off readily at their base must afford much economy of time and effort on the part of the bee, compared to resorting to the laborious method of cutting circular discs out of leaves. Whether this single nest is indicative of the normal behavior pattern of this species can be ascertained only by further observation.

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RECORDS OF SMALL MEGACHILID BEES (Hymenoptera)

CHARLES D. MICHENER[1]

From time to time after revisional papers[2] are prepared it seems important to publish records of additional material in order to bring information on these groups up to date. The present paper consists of records of significant range extensions and other important data, largely obtained from the collections of the California Insect Survey of the University of California and the Snow Entomological Collections of the University of Kansas.

Heriades timberlakei Michener

This species has not previously been recorded from Nevada.

[1] Contribution No. 756 from the Department of Entomology, University of Kansas, Lawrence.

[2] A list of the revisional papers is found in Michener, 1949, Jour. Kansas Ent. Soc., 22:41-59.

Charleston Mountains, Nevada, 9000 feet altitude, June 21, 1940 (R. M. Bohart); Ely, Nevada, June 30, 1950 (C. D. Michener); Connors Pass, White Pine County, Nevada, June 29, 1950 (C. D. Michener); Salt River, Arizona, June 16, 1950 (R. H. Beamer); Carrizo Creek, Arizona, June 16, 1950 (R. H. Beamer).

Heriades gracilior Cockerell

This species is new to California and previous Colorado records have been doubtful.

Swissvale, Colorado, June 17 (T. D. A. Cockerell); Corona and Carrizozo, New Mexico, June 8 and 10, 1950 (R. H. Beamer); Ruidoso and Moriarty, New Mexico, June 23 and 26, 1950 (R. H. Beamer); Pinon Flat, San Jacinto Mountains, California, May 30, 1939 (E. G. Linsley) and May 21, 1940 (C. D. Michener).

Prochelostoma philadelphi (Robertson)

The following are by far the westernmost records of this species, previously known from Illinois and the states to the eastward:

Lawrence, Kansas, May 12, 1950, on *Philadelphus* (R. H. Beamer). Manhattan, Kansas, May 19, 1948 (James B. Kring and Roland Fischer).

Chelostoma minutum minutum Crawford

Buck's Lake, Plumas County, June 23, 1949 (J. W. MacSwain).

Chelostoma minutum incisulum Michener

The range of this subspecies, formerly known only from the San Francisco Bay region, is greatly extended by the following records:

Woody, Kern County, California, April 24, 1949, on *Phacelia* (E. G. Linsley, J. W. MacSwain, R. F. Smith); Glennville, Kern County, California, April 24, 1949, on *Gilia* (same collectors).

Chelostoma minutum cockerelli Michener

The specimens recorded below came from an area where the *Phacelia* visiting subspecies, *C. minutum minutum* Crawford or *C. minutum marginatum* Michener would be expected. If one or the other of them actually occurs in the area, *cockerelli* will presumably have to be regarded as a distinct species.

Camp Baldy, Los Angeles County, California, June 26, 1950, on *Eriodictyon* (P. D. Hurd).

Proteriades xerophila (Cockerell)

Three miles south of Palo Verde, Imperial County, California, April 8, 1949 (P. D. Hurd).

Proteriades basingeri (Timberlake and Michener)

The single male specimen recorded below provides a second locality for this species. It differs from the type series in the slightly more protuberant first metasomal sternum.

Six miles east of Temecula, Riverside County, California, April 11, 1950 (L. W. Quate).

Anthocopa laevibullata Michener

This species, hitherto known only from eastern California, is here recorded for the first time from Utah.

Hanna, Utah, July 14, 1949 (R. H. Beamer); Hope Valley, Alpine County, California, July 9, 1948 (J. W. MacSwain).

Anthocopa hypostomalis Michener

A small series of this species, previously known from a single specimen, is from the following locality:

Palm Desert, Riverside County, California, April 11, 1950 (P. D. Hurd).

Anthocopa tridonta usingeri Michener

A northern record for this species is as follows:

El Portal, Yosemite, California, June 3, 1938.

Hoplitis biscutellae (Cockerell)

This is a desert species, known from California to New Mexico. The following is the first record from Texas:

Hot Springs, Big Bend Park, April 11, 1949, on *Prosopis juliflora* (R. H. Beamer, C. D. Michener).

Ashmeadiella sonora Michener

The first three records below show that the species occurs in Baja California, the fourth is the first record for the species outside of the desert, and the fifth is a new record for Arizona.

Fifteen miles north of San Ignacio, Baja California, Mexico, September 29, 1941 (Ross and Bohart); San Pedro, Baja California, Mexico, October 7, 1941 (Ross and Bohart); Big Canyon, Sierra Laguna, Baja California, Mexico, October 13, 1941 (Ross and Bohart); Wood Lake, Tulare County, California, May 21 and June 12 and 18, 1947, in rotary trap (N. W. Frazier); Casa Grande, Arizona, July 6, 1950 (R. H. Beamer).

Ashmeadiella leucozona Cockerell

The following are the first records of the species from Baja California and from Arizona:

El Mayor, Baja California, April, 1939 (C. D. Michener); twelve miles south of Palacio, Baja California, April, 1939 (C. D. Michener); Santa Rita Mountains, Arizona, May 9, 1937 (W. Benedict).

Ashmeadiella gillettei cismontanica Michener

The holotype and paratypes (females) from Perris, California, differ from *A. gillettei rufiventris* Michener by the dark tegulae and extensive black areas on the dorsum of the abdomen.

A good series of this subspecies, previously known only from southern California, is from the Fresno County locality listed below, while a single specimen is from Contra Costa County. As this last specimen was obtained on the same day as the others, it seems possible that an error was made in labeling and that it actually came from Fresno County.

The male, here described for the first time, agrees with that of *A. g. rufiventris* Michener (1939, Amer. Midland Nat., 22:33) except that the tegulae are usually darker and there is considerable black on the abdomen. The first metasomal tergum is usually entirely red, the second and third have a black or dusky middorsal patch, the remaining terga are largely black but are red laterally. The posterior margins of these terga are usually red, as are the teeth of the sixth tergum.

Mendota, Fresno County, California, April 23, 1949, some on *Melilotus* (E. G. Linsley, J. W. MacSwain, R. F. Smith); Clayton, Contra Costa County, California, April 23, 1949 (R. F. Smith).

Ashmeadiella difugita difugita Michener

A character of this species not mentioned in the original description is the transverse sulcus across the sixth metasomal sternum of the female similar to that of *A. gillettei* and its subspecies. The punctation of this sulcus is only slightly coarser than that of the rest of the sternum. This character is shared with the subspecies described below.

San Gabriel Mountains north of Azusa, California, July 2, 1950 (H. Rothke); Camp Baldy, Los Angeles County, California, July 11, 1950 (A. T. McClay).

Ashmeadiella difugita emarginatula new subspecies

Ashmeadiella difugita Michener, 1939, Amer. Midland Nat., 22:41 (Truckee record only)

Female: Agrees with *A. difugita* but anterior margin of clypeus with minute median emargination delimited by slightly protruding angles. Four of the nine specimens from Lassen County have the femora entirely black instead of the hind femora red. (Only those with red hind femora are designated as holotype and paratypes.)

Holotype female and four female paratypes: Bridge Creek Camp, Lassen County, California, July 9, 1949 (P. D. Hurd, J. W. MacSwain, E. I. Schlinger). One female paratype: Truckee, California, July 9, 1927 (E. P. Van Duzee). An additional specimen is from Hallelujah Junction, Lassen County, California, June 27, 1949 (F. Morishita).

The holotype is the property of the California Insect Survey, University of California, on loan to the California Academy of Sciences. Paratypes will be placed at the California Academy of Sciences, the University of California, the University of California at Davis, and the Snow Entomological Collections.

Ashmeadiella occipitalis Michener

This species is new to Mexico.

Coyote Cove, Concepcion Bay, Baja California, October 1, 1941; Cam-

pole, Baja California, October 2, 1941; Big Canyon, Sierra Laguna, Baja California, October 13, 1941 (all Ross and Bohart).

Ashmeadiella foveata Michener

Tanbark Flat, Los Angeles County, California, July 2, 1950 (P. D. Hurd); Cedar Canyon, Providence Mountains, California, May 27, 1950 (H. E. Cott).

Ashmeadiella opuntiae Cockerell

Baboquivari Mountains, Arizona, July 24, 1941 (R. H. Beamer); Patagonia, Arizona, July 17, 1950 (R. H. Beamer); Willow Springs, Kern County, California, April 27, 1936; Cedar Canyon, Providence Mountains, California, May 27, 1950 (H. E. Cott).

Ashmeadiella biscopula Michener

Duncan, Arizona, June 15, 1950 on *Prosopis* (R. H. Beamer).

Ashmeadiella rufitarsis Michener

This species exhibits several peculiar features that make it one of the most remarkable species of the subgenus. *Ashmeadiella* proper. All specimens thus far collected from flowers have been visiting *Eriogonum gracile*. Perhaps correlated with this apparent restriction to a single species of flower, the mouthparts are unusual. The proboscis is short, in repose not extending behind the proboscidial fossa; the maxillary galeae are unusually hairy, being provided on their outer margins with stiff straight hairs, a condition apparently unique in the genus; the maxillary palpi are minute, two segmented (four segmented elsewhere in the genus); and the first segment of each labial palpus is distinctly shorter than the next and unusually broad.

The following is a new record for this species:

Pulga, Butte County, California, August 19, 1939, on *Eriogonum gracile* (C. D. Michener).

Ashmeadiella cubiceps clypeata Michener

An excellent series of both sexes was collected at Mendota, Fresno County, California, April 23, 1949 (E. G. Linsley, J. W. MacSwain, R. F. Smith). Most of the males have the median ocellus behind the midpoint between the antennal bases and the posterior edge of the vertex, contrary to the key and description previously published (Michener, 1939, Amer. Midland Nat., 22:56). Some females are as small as 5 mm. in length and some males 4 mm.

Ashmeadiella pronitens (Cockerell)

This species has hitherto been known with certainty only from Colorado. Bondurant, Wyoming, August 4, 1949 (R. H. Beamer).

Ashmeadiella australis (Cockerell)

It is surprising to find this species, previously known only from California, in eastern Nevada.

Connors Pass, White Pine County, Nevada, June 29, 1950, on *Pentstemon* (C. D. Michener).

Ashmeadiella clypeodentata simplicior Michener

This subspecies, described from the Big Bend region of Texas, is new to Arizona. It is possible that this is the same as *A. neomexicana* (Cockerell), the only known specimen of which is larger and apparently with a more protuberant clypeal apex.

Santa Rita Mountains, Arizona, May 9, 1937 (W. Benedict).

Ashmeadiella breviceps Michener

This species is new to Mexico.

El Mayor, Baja California, Mexico, April, 1937 (C. D. Michener); Maricopa Mountains, Arizona, April 13, 1947 (H. and M. Townes).

A RARE WING DEFORMITY IN DELPHACINE FULGORIDS (Homoptera-Fulgoridae-Delphacinae)

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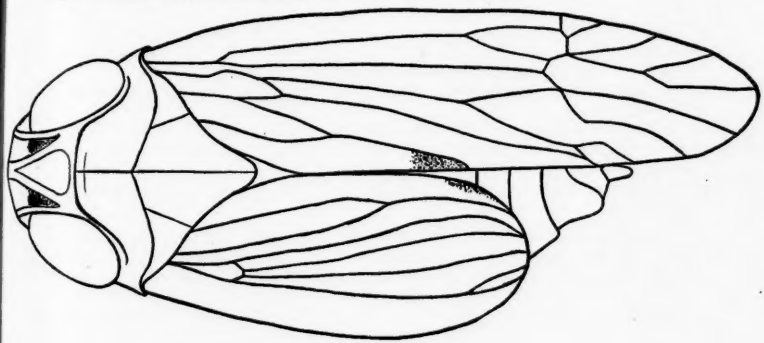
Numerous brachypterous specimens of *Delphacodes consimilis* (Van D.) were collected on the sedge, *Scirpus microcarpus* P. at Granite Dells, Arizona, July 3, 1950. A deformed specimen illustrated here was among those taken. Normally in brachypterous specimens the front wings extend slightly beyond the abdomen. In this specimen the right wing is normal while the left is shortened to just beyond the middle of the clavus. The number of longitudinal veins is the same in both wings; however the branching is distinctly not the same. In my experience with thousands of specimens in this group this type of deformity is definitely uncommon.



Delphacodes consimilis

*Contribution No. 757 from the Department of Entomology, University of Kansas, Lawrence.

A STUDY OF THE GENUS TEPHRITIS LATREILLE IN THE NEARCTIC REGION NORTH OF MEXICO (Diptera: Tephritidae)[1]

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INTRODUCTION

The literature concerning the genus *Tephritis* for the region covered in this study is very meager. Loew (5) listed eight species for the genus but gave no key. Phillips (7) presented a key to four species occurring in northeastern America under the genus *Euribia* Hendel (not Meigen 1800). A new subgenus, *Tephritoides,* under *Trupanea,* was proposed by Benjamin (1) to include certain of the species having a *Trupanea*-like wing pattern. Hering (4) published a key to the *Tephritis* of the world which included eight of the species listed in this study. Information other than that cited above is scattered and is confined largely to notes on distribution and the description of new species.

This study, while handicapped by lack of material, has on the other hand been aided immensely by the acquisition of a number of tephritid genotypes made available through the courtesy of Dr. E. M. Hering, Zoologisches Museum, Berlin. These include genotypes representing the following genera: *Oxyna* Robineau-Desvoidy, *Paroxyna* Hendel, *Tephritis* Latreille, and *Trupanea* Guettard. A study of these has greatly aided the author in the placement of a number of species long incorrectly associated with *Tephritis.*

Attempts were made to find characters in the female terminalia of the species involved that could be used in their separation, but without success.

In this study eight previously described species are listed, two are described as new, and one synonomy is proposed.

THE GENUS *TEPHRITIS* LATREILLE

Tephritis Latreille, Dictionn. d'Hist. Natur., Deterville, 24:196, 1804. (two species)
Tephritis Latreille: Coquillett, Proc U. S. Nat. Mus., 37 (1719): 614, 1910. (erroneously designated *Musca solstitialis* Linnaeus as genotype)
Tephritis Latreille: Cresson, Ent. News, 25: 275, 1914. (genotype, *Musca arnicae* Linnaeus, the first species)
Euribia Hendel (not Meigen 1800): Phillips, Jour. N. Y. Ent. Soc., 33 (3): 149, 1923.
Trupanea (Tephritoides) Benjamin ,U. S. Dept. Agric. Tech. Bul., (401): 58, 1934. (subgenotype, *Euaresta subpura* Johnson)
Trypanea Schrank: Malloch, Proc. U.S. Nat. Mus., 92 (3133): 1, 1942. (in part)

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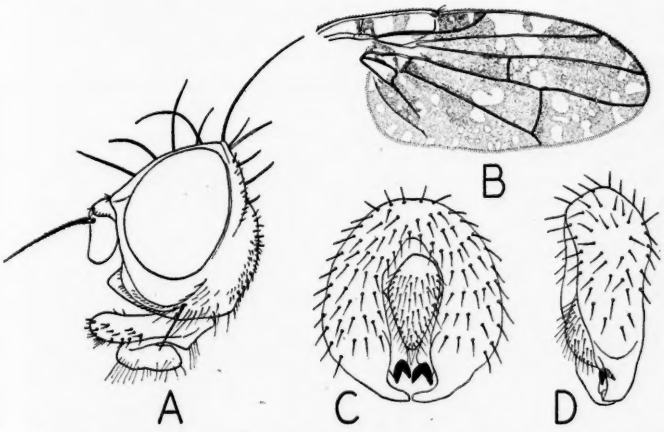
[2] Now Assistant Entomologist, Kentucky Agricultural Experiment Station, Lexington, Kentucky.

Generic characters: Head (Text fig. 1, A) wider than high. Frons flattened, width across median ocellus about one-half maximum head width and slightly wider than maximum width of one eye. Frontale bare or with some very fine setae centrally, variable. Face weakly concave, antennal fovae shallow. Oral opening rounded. Two pairs upper frontoorbitals; two pairs lower frontoorbitals; one pair strong ocellars; one pair postocellars; one pair strong inner verticals; one pair pale weak outer verticals that are less than half the length of inner pair; postoculars pale, rather stout and intermixed with shorter setae; genal bristle well developed.

Thorax: Somewhat longer than broad as viewed from above. Scutellum flattened, subtriangular. A dark spot behind wing base and directly below postalar bristle. One pair dorsocentrals, at transverse suture; one pair acrostichals that are well ahead of a transverse line through intraalars but behind a line midway between supraalars and intraalars; one pair supraalars; one pair intraalars; one pair postalars; one pair presuturals; one pair humerals; two pairs notopleurals; one pair sternopleurals; one pair pteropleurals; one strong pair and from one to two weaker pairs mesopleurals; two pairs marginal scutellars, one near base, one near apex.

Legs: Front femora with a row of strong setae ventrally and a pair of parallel rows of shorter setae posterodorsally; not swollen in either sex. Middle femora with an anterior row of short setae that extend from base to about the middle of the segment. Middle tibiae with one apical spur. Hind femora usually with but one subapical seta located anterodorsally (when more than one they are placed in longitudinal row and not side by side). Hind tibiae with a row of short setae anterodorsally.

Wing (Text Fig. 1, B): The first longitudinal vein is bristled along its entire length except for area immediately below upturned apex of the sub-



Text figure 1. *Tephritis arnicae* (Linnaeus). A. Head (side view); B. wing; C. terminalia of male (anal view); D. terminalia of male (side view).

costal vein which is usually bare. Third longitudinal vein bare above, setose below to anterior crossvein.

Abdomen: Broader than, and as long as or slightly longer than thorax. Hind margin of apical tergite with a row of long setae. Ovipositor sheath flattened, tapering apically. Male terminalia (Text Fig. 1, C-D).

The above generic description was based on seven specimens (three females and four males) of *Tephritis arnicae* (Linnaeus) which Dr. E. M. Hering kindly presented to the author. The species treated here agree in structure with the genotype except that in a few cases the anterior oral margin is somewhat less strongly developed, the palpi do not extend forward as much, and in a few species the abdomen of the males is less broadened apically.

As can be seen in the synonomy most of the species treated here have at some time been associated with the genus *Euaresta* Loew. However, the differently shaped head, the swollen fore femora of the male, and the peculiarly striated male terminalia will serve to distinguish that genus from *Tephritis*.

Paroxyna Hendel and *Neotephritis* Hendel are likely to be confused with *Tephritis* but the very narrow thoracic squamae of *Paroxyna* and the third pair of lower frontoorbital bristles of *Neotephritis*, in addition to other characters, will distinguish these genera.

The inclusion in *Trupanea* by Malloch (6) and Benjamin (1) of certain of the species treated here deserves discussion at this point. The species envolved are *stigmatica* Coquillett discussed by Malloch, and *pura* Loew, *subpura* Johnson, and *pacifica* Doane (a synonym of *araneosa* Coquillett) discussed by Benjamin. Malloch did not consider the presence of the apical scutellar bristles nor the presence of but two pairs of lower frontoorbital bristles as are found in *stigmatica* to be sufficient to exclude the species from *Trupanea*. On the basis of this interpretation the species, due to its wing pattern, readily fell into *Trupanea*. Benjamin gave only subgeneric value to the bristling of the frons and scutellum, as described above, in his interpretation of *Trupanea*. He made *subpura* the type of a new subgenus *Tephritoides* and cited *pura* and *pacifica* as belonging there also. The interpretations of these authors complicates the position of *Trupanea*. If the characters of *Tephritoides* are adhered to rigidly *stigmatica* could not be included since it lacks the general reticulate pattern in addition to its preapical stellate mark. Likewise it would not fit Benjamin's definition of *Trupanea* s. str. since it has a well developed pair of apical scutellar bristles and only two pairs of lower frontoorbital bristles. Malloch wrote, "In almost all the species with the characteristic starlike preapical black mark on the wing there is a small, round, hyaline mark or spot immediately below the extreme tip of the second vein, whereas in the other groups of species in which there are numerous brown marks on the basal half of the wing there is no small spot at this point, but instead there is one above the tip of the second vein." This does not seem to hold as *araneosa, subpura,* and *angustipennis* each have the hyaline spot or mark below the apex of the second vein but also have numerous brown marks on the basal half of the wing. These species were not mentioned by Malloch.

The author feels that a more acceptable solution to the problem of de-

ining the generic limits of *Trupanea* could be arrived at by restricting the genus to those species possessing one pair of scutellar bristles, three pairs of lower frontoorbital bristles (the anterior pair weak but rarely absent), and the typical preapical stellate mark on the wing. This is essentially the definition of Hendel (2). Thus the tendency of wing patterns in certain of the species of *Tephritis* to be *Trupanea*-like is accorded only specific significance. The wing pattern is definitely variable in this respect in the genus while at the same time the other characters interpreted here as of generic value seem to be quite stable.

NOTES ON SPECIES PREVIOUSLY ASSIGNED TO *TEPHRITIS*

Tephritis corpulenta v. d. Wulp and *T. fibulata* v. d. Wulp: Neither of these species were recognized in the material studied. The wings of these species as figured by v. d. Wulp (11) strongly suggest that they belong to *Paroxyna* Hendel.

Tephritis murina Doane, *T. albiceps* Doane, *T. variabilis* Doane, *T. pallidipennis* Cresson, *T. tenebrosa* Coquillet, *T. obscuripennis* Snow, *Trypeta (Tephritis) clathrata* Loew, and *Trypeta genalis* Thomson: These species belong to *Paroxyna* Hendel. The genotype of *Paroxyna* has been examined by the author and comparisons were made with the above species. In addition the types of *obscuripennis* Snow, *pallidipennis* Cresson, and *variabilis* Doane have been seen. *Obscuripennis* Snow is now known as *snowi* Hering; the species being renamed by Hering (4) when placed in *Paroxyna* since it was preoccupied by *obscuripennis* Loew, 1850.

Musca fucata Fabricius and *Tephritis picturara* Snow: *Fucata* was included in Phillips (7) key with *picturata* as a synonym. Benjamin (1) has correctly perceived that the two species belong in *Acinia* Robineau-Desvoidy. Whether *picturata* is a synonym of the true *fucata* or is *fucata* of authors and is actually distinct has not been established.

Trypeta finalis Loew and *Tephritis inornata* Coquillett: These species belong to *Neotephritis* Hendel with *finalis* the genotype. *Tephritis affinis* Snow is a synonym of *finalis*.

Trypeta acutangula Thomson and *T. abstersa* Loew: These species were placed by Benjamin (1) in the subgenus *Euarestoides*, under *Trupanea* Guettard. Hering (3) in a later study gave *Euarestoides* full generic rank again discussing both of the species; the author accepts the latter treatment.

Trypeta (Tephritis) baccharis Coquillett: This is a very interesting and puzzling species. The variable number of lower frontoorbital bristles (two to four pairs) and the peculiar wing pattern removes it from consideration in *Tephritis* as the genus is interpreted in this study. The author has examined a number of the known species of *Eutreta* and feels that the genus belongs to, or is very closely related to, that genus; further study will be needed to verify this. The species now stands in many collections under the genus *Icterica* Loew. *Baccharis* has been compared with the genotype of *Icterica, seriata* Loew, and the two are very definitely generically distinct.

Tephritis palpalis Coquillett: This species belongs to the genus *Oxyna* Robineau-Desvoidy and was discussed by the author in an earlier paper (9).

Trypeta (Tephritis) geminata Loew: This species belongs to the genus *Jamesomyia* Quisenberry and was discussed in an earlier paper (8).

Tephritis wolffi Cresson, and *T. gemella* Coquillett: These species belong to *Euaresta* Loew and were discussed by the author in an earlier paper (10).

KEY TO THE SPECIES

1. Apical margin of the wing from a point approximately midway between the apices of the second and third longitudinal veins and extending directly posteriorly to wing margin wholly whitish ..... *rufipennis*
   Apical margin of the wing without such a whitish band 2
2. Thorax predominantly bright yellow pollinose; costal cell without distinct brownish spots; preapical dark brown area entire and not broken by many small and confluent hyaline spots ..... *subpura*
   Combination of characters not as above 3
3. The usual preapical dark brown area of the wing obscured by numerous round and confluent subhyaline spots; the dark pattern in the marginal cell immediately below the stigma usually marked with at least one yellowish or subhyaline spot (if no spot present then the anterior arm of the Y-shaped mark at wing apex is broken and represented only by a spot at tip of third longitudinal vein, or, is present but conspicuously narrower than the posterior arm) 4
   The preapical dark area usually with at most only a few round subhyaline spots and its appearance never obscured by these; the dark pattern in the marginal cell immediately below the stigma unmarked; the Y-shaped mark at the wing apex never as described above 5
4. The brown pattern in the third posterior and axillary cells extends to the wing margin along its entire length (the brown along the margin in the axillary cell may be so faint as to be hardly visible) ..... *californica*
   The brown pattern in the third posterior and axillary cells does not extended to the wing margin except at the extreme tip of the former ..... *arizonaensis*
5. Wing with a broad, dark brown band crossing the stigma and running obliquely to the anterior crossvein, this band devoid of subhyaline or whitish spots (in related species possessing a similar band, one or more subhyaline or whitish spots are usually present, or if spots are absent the area of the wing posterior to fourth longitudinal vein is more extensively covered with brown and the rays are not as described for this species); brown pattern of the wing confined largely to that portion of the wing anterior to the fourth longitudinal vein with the following narrow rays extending posteriorly: two across the second posterior cell to wing margin (these are never joined together or to the following ray), one extending over the posterior crossvein to wing margin, one crossing apex of discal cell (may sometimes be joined centrally to preceding ray) and usually reaching to wing margin though occasionally only to fifth vein, and a short

one just basad of the preceding ray that may or may not reach the fifth vein ..... *stigmatica*
Wing without the above combination of characters 6

6. The broad brown band extending posteriorly from the stigma running directly to at least the third longitudinal vein and often to the fourth 7
The broad brown band extending from the stigma running obliquely apicad and terminates at or beyond a point directly anterior to the anterior crossvein 8

7. The two brown rays extending into the second posterior cell from the preapical brown area and the brown ray extending over the posterior crossvein do not reach the wing margin (these rays sometimes extend very close to wing margin but when so they are very pale towards their tips); apex of the third posterior cell without a rounded whitish spot ..... *angustipennis*
The above mentioned rays all extend to posterior margin of wing; apex of the third posterior cell with a rounded, whitish spot ..... *araneosa*, part

8. The Y-shaped brown mark at the wing apex is broken, the arms being separated from the stem; the brown color in the third posterior cell reduced to small spots or fragments along the fifth longitudinal vein ..... *michiganensis*
The Y-shaped brown mark at the wing apex is complete; the brown color in the third posterior cell extending posteriorly from the fifth vein to at least the middle of the cell and usually marked with large subhyaline spots 9

9. The apical edge of the second of the two large subhyaline spots in the marginal cell beyond the apex of the first longitudinal vein extends well beyond a line drawn directly anteriorly from the anterior apex of the posterior cross vein to wing margin ..... *araneosa*, part
The apical edge of the second of the two large subhyaline spots in the marginal cell beyond the apex of the first longitudinal vein extends at most to a line drawn directly anteriorly from the anterior apex of the posterior crossvein to wing margin and usually behind 10

10. The apices of the fifth longitudinal vein beyond the junction with posterior crossvein broadly bordered with brown at least on margin next the wing apex ..... *webbii*
The apex of the fifth longitudinal vein beyond the junction with the posterior crossvein narrowly bordered with brown ..... *pura*

Tephritis rufipennis Doane

(Pl. 1, Fig. 4)

Tephritis rufipennis Doane, Jour. N. Y. Ent. Soc., 7 (3): 190, 1899; Hering, Siruna Seva, (5): 18, 1944.
Euaresta rufipennis (Doane): Coquillett, Invertebrata Pacifica, 1:31, 1904.

Ocellar triangle black. Frontale with a few short, light brownish setae. Pollen of thoracic dorsum brownish except for two small grayish spots anterior to transverse suture. Pleura brownish pollinose except for area around

propleura and lower sternopleura. Scutellum dark brown, nearly black, except on lateral margins. The pollen on postnotum of the specimen examined is more of a light brown than grayish as described by Doane (1899); however, the latter is sparsely present. Much grayish pollen intermixed with the brown on abdomen. Ovipositor sheath 0.45 mm. long[3], with a dark brownish spot at basal corner dorsally and a mediobasal one ventrally, remainder brownish yellow, the short setae whitish and densest on basal half. No setae were found on the third vein as had been described by Doane.

TYPE LOCALITY: California.

One of the two male cotypes is in the collection at the State College of Washington, the location of the other one is unknown to the author.

DISTRIBUTION: Known only from California.

FOOD PLANT: Unknown.

The above notes were based on a single female from San Mateo County, California (Baker).

Tephritis subpura (Johnson)
(Pl. 1, Fig. 6)

Euaresta subpura Johnson, Psyche, 16: 114, 1909; Phillips, Jour. N. Y. Ent. Soc., 31 (3): 147, 1923.

Trupanea (Tephritoides) subpura (Johnson): Benjamin, U. S. Dept. Agric. Tech. Bul., (401): 59, 1934.

Tephritis subpura (Johnson): Hering, Siruna Seva, (5): 25, 1944.

Ocellar triangle brown. The dark condition of the postnotum seems to be variable as it is present in only one of the specimens examined. The one female from Key Largo, Florida, has the abdomen wholly dark except for the somewhat brownish yellow posterior margins of the tergites and the ovipositor sheath is dark brown at tip, the center and sides being yellowish brown. The setae on the abdomens of the specimens examined were found to be wholly pale yellow or whitish except for the long brown ones on posterior margin of apical tergite and no other black or brown ones were found to be present as indicated in Johnson's (1909) description. Ovipositor sheath (except as cited above) of the same color as abdomen, tip narrowly margined with brown, covered with pale setae as on abdomen, length 0.46mm.

TYPE LOCALITY: New Jersey.

Type, female, in the Museum of Comparative Zoology.

DISTRIBUTION: New Jersey and Florida.

HOST PLANT: *Baccharis glomeruliflora* Pers.

The above notes were based on two females and one male, fifteen miles southwest of Malabar, Florida, May 5-10, 1931 (D. J. Nicholson), and one female, Key Largo, Florida, July 23, 1934 (R. H. Beamer).

Tephritis arizonaensis, n. sp.
(Pl. 1, Fig. 1)

Female: Head and its appendages yellow, face and lunula somewhat paler. A small V-shaped mark just above the neck and the ocellar triangle black.

[3] Lengths of the ovipositor sheath as given in this study represent measurements taken dorsally from the dry specimen.

Occiput with grayish pollen that is densest on dark area. Third antennal segment subacute on upper corner, the lower corner obtuse; setae on first segment pale yellow, that on the second mostly brown; arista dark brown, yellowish at base. Setae of palpi whitish except for brownish tuft at apex, that on cheeks and occiput whitish or pale yellow. Frontoorbital bristles, except the posterior pair of uppers, ocellars, and inner verticals brown, remaining bristles pale yellow or whitish.

Thorax: Mesonotum 1.30 mm. long. Black in ground color except for humeri, notopleura, and margins of scutellum which are yellowish; grayish pollinose except as follows: brownish on median area of scutellum and a prescutellar area; yellowish on humeri, notopleura, upper portion of mesopleura and on the margins of scutellum. Bristles of notum, scutellum and the anterior pair of notopleurals dark brown, all others pale yellow or whitish. The usual short setae are pale yellowish.

Legs: Yellow, thinly whitish pollinose, with pale yellow and whitish setae intermixed.

Wings: The pattern brownish and broken up by very large confluent subhyaline spots. Length 3.10 mm. Halteres pale yellow.

Abdomen: The tergites black in ground color except for the first two which are yellow; grayish pollinose on dark areas, yellow on the remainder. The setae are pale yellow except for some longer stiff, brown ones which are placed on the hind margin of the apical tergite. Venter yellow, with pale yellow pollen; the short setae pale yellowish. Ovipositor sheath 0.46 mm. in length, yellow, the tip narrowly black and the upper lateral basal corners brown.

Male: Similar to female except that the third tergite laterally and a small median area on the fourth and fifth tergites of the abdomen are yellow. Terminalia yellowish.

TYPE MATERIAL: Holotype female, allotype male, Tumicari Mountains, Arizona, July 22, 1938 (R. H. Beamer); paratypes, one female, same data as above, one male and one female, Santa Rita Mountains, Arizona, July 22, 1938 (L. W. Hepner), and one female, same data, except July 19, 1938, one male, Tucson, Arizona, June 17, 1917 (J. M. Aldrich). The Tucson paratype in the United States National Museum; the remainder of the series in the Snow Entomological Collection, Kansas University.

HOST PLANT: Unknown.

The coloration of the thorax and abdomen of this species is variable as follows: three very faint anteriorly directed vittae may project from the prescutellar brownish pollinose area; the scutellum may be wholly yellowish or gray; the abdomen may be entirely dark and with gray pollen; those male specimens with yellow on the abdominal tergites may have this color more prominent on the lateral and hind margins of tergites two and three. The general spotting of the wing shows some minor variation and the appearance of the Y-shaped mark at wing apex is quite variable as follows: it may be as figured, with the lower arm broken, or with both arms broken and represented only by dots on the apices of the third and fourth longitudinal veins, or both arms may be complete.

The species is nearest to *californica* but differs from that species mainly in the wing characters as indicated in the key.

Tephritis californica Doane
(Pl. 1, Fig. 9)

Tephritis californica Doane, Jour. N. Y. Ent. Soc., 7 (3): 190, 1899; ibid, 8 (1): 48, 1900.
Euaresta araneosa (Coquillett), Jour. N. Y. Ent. Soc., 7 (4): 266, 1899. (supposed synonomy: misidentification)

Ocellar triangle and a V-shaped mark on occiput just above the neck black. Occiput with dense, dull yellow pollen. Third antennal segment rounded only on lower anterior corner the upper one subacute. Mesonotum 1.40-1.80 mm. long. Thorax typically yellowish pollinose except for the brownish median portion of the scutellum and the grayish postnotum but with variations as follows: the yellowish pollen may be largely replaced by gray and brown; scutellum may be wholly brown; notum may be mainly brown with grayish pollen anteriorly. Abdomen typically yellowish but with variations as follows: tergites marked with black except on posterior margins, that color on the apical tergite usually forming two large lateral spots, or with tergum wholly dark and with grayish and dull yellow pollen intermixed. Venter yellowish on all specimens examined except those with wholly dark tergum in which case it is dark. Ovipositor varies from yellowish brown to wholly black with some specimens having the reddish lateral spots as described by Doane (1899). The basal maculation of the wings in the specimens examined is darker than figured by Doane. The outstanding difference in the wings of the specimens studied here as compared with Doane's figure is the absence of the anterior arm of the Y-shaped dark mark at the wing apex. Only one specimen shows this arm fully developed.
TYPE LOCALITY: Palo Alto, California.
Type, female, in the collection at the State College of Washington.
DISTRIBUTION: Known only from California.
HOST PLANT: Unknown.

The type has been examined and it was found to be damaged, the wings being absent. The variations from the type in the body colorations as found in a few of the specimens examined are not considered of significance since intergradations in this respect were found in the more yellowish forms. Coquillett (1899) believed this species to be synonomous with *araneosa* but no basis for the support of this could be found in this study.

Twenty specimens were examined in this study from the following localities: CALIFORNIA: Cloverdale; Lompoc; Winters; Mill Valley; Santa Rosa; San Mateo County; Mt. Tamalpais; Ross; Palo Alto. March to August.

Tephritis stigmatica (Coquillett)
(Pl. 1, Fig. 11)

Urellia stigmatica Coquillett, Jour. N. Y. Ent. Soc., 7 (4): 266, 1899; Coquillett, Invertebrata Pacifica, 1:31, 1904; Cresson, Trans. Amer. Ent. Soc., 33: 106, 1907.
Trypanea stigmatica (Coquillett): Malloch, Proc. U. S. Nat. Mus., 92 (3133): 8, 1942.

Second antennal segment often marked with black dorsally and narrowly along lateral margins. Ocellar triangle black. Humeri and notopleura occa-

sionally with yellowish pollen. Thorax often with brownish pollinose areas as follows: a large prescutellar spot that emits five anteriorly directed vittae, one median, one crossing anterior dorsocentral bristles, and one on either side laterad of dorsocentrals, all extending to or slightly beyond transverse suture; a spot on posterior area of mesopleura and pteropleura. Legs with varying amounts of grayish pollen, mainly on femora. Basal half of wing occasionally with a yellowish hue. The ray crossing posterior crossvein and the subapical one crossing discal cell occasionally separated only by a few whitish spots. Subapical ray crossing discal cell usually extends to posterior margin of wing though rarely it terminates at fifth vein. Sixth vein and that portion of the fifth vein from its base to second ray crossing discal cell often bordered with brown. Ovipositor sheath 0.53-0.73 mm. long.

TYPE LOCALITY: Colorado.

Type, male, in the United States National Museum.

DISTRIBUTION: Colorado; New Mexico; California; Texas; Idaho; Arizona; Oregon; Utah.

HOST PLANT: Unknown.

The above notes were based on twenty specimens from the following localities: COLORADO: Adams County; Costilla County; Sloss. NEW MEXICO: Los Cruces. OREGON: Silver Creek Falls, Marion County; Mary's Peak, Benton County; Boyer. UTAH: St. George. CALIFORNIA: Oakland. March to October.

Tephritis araneosa (Coquillett)

(Pl. 1, Figs. 2, 5, 7, 10)

Trypeta (Euaresta) araneosa Coquillett, Canad. Ent., 26: 74, 1894.
Euaresta araneosa (Coquillett), Jour. N. Y. Ent. Soc., 7 (4): 266, 1899.
Urellia pacifica Doane, Jour. N. Y. Ent. Soc., 7 (3): 192, 1899; ibid, 8 (1): 48, 1900; Coquillett, ibid, 7 (4): 266, 1899 (synonomy); Cresson, Trans. Amer. Ent. Soc., 33: 105, 1907. (synonomy, following Coquillett)
Urellia aldrichii Doane, Jour. N. Y. Ent. Soc., 7 (3): 192, 1899. (new synonomy)
Euaresta aldrichii (Doane): Coquillett, Jour. N. Y. Ent. Soc., 7 (4) :266, 1899.
Tephritis araneosa (Coquillett): Hering, Siruna Seva, (5): 31, 1944.
Tephritis aldrichii (Doane): Hering, Siruna Seva, (5): 31, 1944.
Tephritis pacifica (Doane): Hering, Siruna Seva, (5): 25, 1944.
Trupanea (Tephritoides) pacifica (Doane): Benjamin, U. S. Dept. Agric. Tech. Bul., (401): 59, 1934.

A cotype of each of the following species, *aldrichii* and *pacifica*, were studied by the author in addition to a female closely compared with the type of *araneosa* by Dr. Alan Stone. No characters could be found to support *aldrichii* and *pacifica* as separate from *araneosa*. The synonomy of *pacifica* had been previously recognized by Coquillett (1899) and Cresson (1907). The following discussion based on the study of one hundred and ninty-two specimens will serve to illustrate the extreme variation of this species as interpreted here.

The pattern of the wing is quite variable. Pl. 1, Figs. 2, 5, 7, and 10 will serve to illustrate the variations found in the specimens examined. The presence and size of a hyaline spot in the submarginal cell above and slightly behind the apex of the anterior crossvein is quite variable. Clear steps of intergradation were found between the condition representing *aldrichii* and

that of *pacifica* as regards this character. Coquillett's (1894) reference to the hyaline spots occurring in the submarginal cell of *araneosa* is not clear. He wrote "five in submarginal cell, of which one is at the base, two near the middle and two between apices of second and third veins". This description will fit the wing of either *aldrichii* or *pacifica* as figured by Doane (1899) since he did not show a hyaline spot in the submarginal cell of *aldrichii* directly below the second one occurring in the marginal cell beyond the apex of the first longitudinal vein. The cotype of *aldrichii* examined by the author shows this spot to be present and in the remaining specimens of the series examined in this study the character was found to be so variable as to be of no significance. The specimen compared with the type of *araneosa* by Dr. Stone has the large hyaline spot in the submarginal cell above and slightly behind the apex of the anterior crossvein. The extension of the broad brown stigmal band ahead of the apex of the first longitudinal vein as shown in Pl. 1, Fig. 5 was at first thought to be of specific significance but intergrading conditions were found. Pl. 1, Fig. 10 represents an extreme found in some of the specimens reared from *Tanacetum huronense* and *Arnica foliosa,* others in this same series exhibited characters overlapping with those previously described. A third hyaline spot in the marginal cell beyond the apex of the first longitudinal vein such as is shown in Pl. 1, Fig 10 appears occasionally.

The pollinosity of the thorax and abdomen varied greatly between gray and brown. In some cases the latter color tended to form rather distinct stripes on the thoracic dorsum. The lateral and ventral margins varied between brown and pale yellow.

The legs were generally found to be wholly yellow but some specimens had the ventral side of the hind femora blackish, this color also increasing in intensity and spreading to the fore and middle femora in other specimens.

The differences in the length of the ovipositor sheath are great (0.31-0.73 mm.) but this condition was not found to coincide with any of the other characters and was considered of no significance.

TYPE LOCALITY: *Of araneosa,* Southern California; *of pacifica,* Corvallis, Oregon; of *aldrichii* (head missing), Brookings, South Dakota.

Type, female, of *araneosa* in the United States National Museum; of *pacifica* and *aldrichii,* one cotype, female, of each in the collection at the State College of Washington, location of the remaining cotypes of these species unknown to the author.

DISTRIBUTION: Widespread over the western United States.

HOST PLANT: *Artemisia dracunculoides* Pursh (nine specimens reared from flower heads of this plant by Miss M. A. Palmer, Colorado A. and M. College); the specimens are in the Colorado A. and M. College Collection. *Tanacetum huronense* Nutt (thirteen specimens reared from this plant by Mr. S. C. Jones, Corvallis, Oregon) and *Arnica foliosa* (two specimens reared from this plant by S. C. Jones and J. Schuh, Corvallis, Oregon); the specimens are in the American Museum of Natural History. Six specimens in the United States National Museum bear the following information on the label, "Ex. *Poa* seeds, Bellingham, Wash., VI-8-45, Sp. surv. no. 26453."

Specimens examined in this study were from the following localities: ARIZONA: Grand Canyon; Oak Creek Canyon; Coconino County. CALI-

FORNIA: East Oakland, Arroyo Seco R.; Halfmoon Bay; San Clara County; Sacramento; Lompoc; Bakersfield; Gold Lake, Sierra County; Topango Canyon; Strawberry; Giant Forest; Monterey; Lone Pine; Mt. Diablo; Yosemite National Park; Nipomo; Summit Placer County; Claremont; Fresno; Laguna Mountains; San Diego; Tuolumne Meadows; Pasadena; Mill Creek Canyon; Baker; Fieldbrook. CANADA: Treesbank and Birch River, Manitoba. COLORADO: Ward; Livermore; Florissant; Divide; Pingree Park; Nederland; Alamosa; Little Beaver Creek; Estes Park; Fort Collins. IDAHO: Moscow; Lewiston; Lowman. IOWA: No locality given. MONTANA: Bozeman. NEVADA: Ely; Ormsby County. NEW MEXICO: Cloudcraft; Jemez Springs; Colfax County. NORTH CAROLINA: Chadbourn. OREGON: Burntwood; Boardman; Waldport; Sparks Lake; Deschutes County; North Powder; Dixie; Upper Klamath Marsh; Republic; Hood River; Aneroid Lake; Baker; Colestin; 22 miles west of Crater Lake, Medford Road; Corvallis, female cotype of *pacifica*. SOUTH DAKOTA: Brookings, female cotype of *aldrichii*. UTAH: Spanish Fork; Woodside; Emigration Canyon; Alton; Pintura. WASHINGTON: 10 miles south of Pateros; Harrah; White Salmon; White Swan; Bellingham; Wenatchee; Pullman; Ritzville; Seattle. WYOMING: Lander; Farson; Big Sandy Creek. February to September.

This species is close to *angustipennis* but differs principally in the characters given in the key.

Tephritis angustipennis (Loew)

(Pl. 1, Fig. 3)

Trypeta angustipennis Loew, Berliner Entomologische Zeitschrift, 5: 382, 1844.

Trypeta (Tephritis) angustipennis (Loew), Smithsn. Inst. Misc. Collect., 11 (256): 293, 1873.

Tephritis angustipennis (Loew): Hendel, Die Fliegen der Palearktischen region, 49, Trypetidae, p. 182, 1927; Hering, Siruna Seva, (5): 31, 1944.

Euaresta angustipennis (Loew): Phillips, Jour. N. Y. Ent. Soc., 31 (3): 146, 1923. (probably araneosa.)

This is a small gray species whose range extends south in the Nearctic region to a few states in the northeastern part of the United States. The species is typically Palaearctic and is believed by the author to be the only member of this genus common to both regions.

Phillips (1923) figured a wing as that of this species, under *Euaresta*, but the species she had before her apparently was *araneosa* as the brown pattern in the second posterior cell and that bordering the posterior crossvein is shown extending to the posterior wing margin.

TYPE LOCALITY: Scandinavian region.

The type material in Zoologisches Museum, Berlin, consists of a male and female.

DISTRIBUTION: Only records for the Nearctic region are recorded here. Alaska; Canada; Northeastern United States.

HOST PLANT: *Achillea ptarmica* L.

Fourteen specimens of this species were examined by the author. The localities of eight of these were as follows: Nova Scotia, New York, and

Alaska, the remaining six were European specimens compared with the type by Dr. E. M. Hering and presented to the author.

Tephritis michiganensis, n. sp.
(Pl. 1, Fig. 8)

Male: Head mainly yellow; area around ocellar triangle, vertical calli, lunula, face and cheeks lighter due to the presence of a thin covering of pale pollen. Ocellar triangle and a large V-shaped mark on occiput just above neck are black. Postorbital area gray pollinose. Third antennal segment dark yellow, obtuse on lower anterior corner, the upper one subacute; first segment with pale setae, second with black; arista dark brown, yellowish at base. The short setae on oral margin anterior to and including the genal bristles are brown, those posterior are whitish and brown intermixed. The principal bristles black except for the postocellars, postverticals, and postocular row which are white. Setae at apex of palpi black, remainder pale. The fine setae of proboscis are pale.

Thorax: Mesonotum 1.60 mm. long. Black in ground color except for the humeri, wing base, mesopleural suture, and upper margin of hypopleura which are yellow. Densely gray pollinose except on the yellow areas in which case it is yellow, and the following brownish areas: a stripe on the posterior half of the mesopleura which is broadest above; a broad dorsal stripe on the scutellum extending its entire length and laterally to the basal scutellar bristles; a spot on the scutum occupying the area from scutoscutellar suture to acrostichals and laterally to postalar bristles and emitting five anteriorly directed rays, one at either lateral margin extending to transverse suture, two submedian ones which cross over dorsocentrals and reach the anterior margin, and a median one extending likewise to the anterior margin of thorax. The short setae are whitish except for a few on the posterior margin of mesopleura and lower sternopleural area which are brown. Posterior notopleural white, all other bristles black.

Legs: Mainly dark yellow; front femora with moderately dense gray pollen on outer surface. Hind femora with a dense gray pollinose ventrolateral stripe. The setae are dark brown except for extreme upper row on front femora which are mainly white, and some whitish on coxae.

Wings: Largely milky white, the brown pattern being present mainly on anterior half of wing. Length 3.93 mm. Halteres yellow.

Abdomen: Black in ground color. The tergites are densely gray pollinose except on the narrow white posterior margin of one to four and the yellow posterior margin of five; the setae are dark brown to black. The sternites are bordered laterally and posteriorly with pale yellow, the median area of each gray pollinose; the short fine setae are whitish. Terminalia dark yellow, the fine setae brown.

TYPE MATERIAL: Holotype male, Birch River, Manitoba, Canada, August 3, 1937 (C. L. Johnson); paratypes, one male, same data as above except (R. H. Beamer), one male, Midland County, Michigan, July 1, 1942 (R. R. Dreisback), one male, Cheboygan County, Michigan, July 20, 1941 (Reese Sailer). The Midland County paratype in the United States National

Museum, the remainder of the type series in the Snow Entomological Collection, Kansas University.

The color pattern of the body in the Michigan specimens is obscured due to desiccation, thus they appear wholly black. Desiccation has likewise largely obscured the pattern on the dorsum of thorax of the Birch River paratype. On some of the specimens there is a dark stripe on the under side of the middle femora. No major variation is present in the wing pattern but some minor deviation does occur as follows: the pale subapical spot in the marginal cell may extend almost across the cell and there may be a small spot on the costal margin just basad of it; the pale area just basad of apex of anterior crossvein, in submarginal cell, may be reduced to a small spot; the small dark spots posterior to fifth vein may be joined to that vein and extend posteriorly as short, narrow rays; the dark spots in the second posterior cell may be in the form of very narrow rays which do not touch either the fourth vein or the wing margin.

HOST PLANT: Unknown.

This species is close to *pura* and *webbi* but differs from both of these species principally in the broken Y-shaped dark mark at the wing apex, and the much reduced condition of the brown pattern in the second and third posterior cells.

Tephritis webbi Doane

(Pl. 1, Fig. 12)

Tephritis webbi Doane, Jour. N. Y. Ent. Soc., 7 (3) :189, 1899; Hering, Siruna Seva, (5): 21, 1944.

Euaresta webbi (Doane): Phillips, Jour. N. Y. Ent. Soc., 31 (3): 147, 1923; Cresson, Trans. Amer. Ent. Soc., 33: 105, 1907; Coquillett, Invertebrata Pacifica, 1:31, 1904; Coquillett, Jour. N. Y. Ent. Soc., 7 (4): 266, 1899.

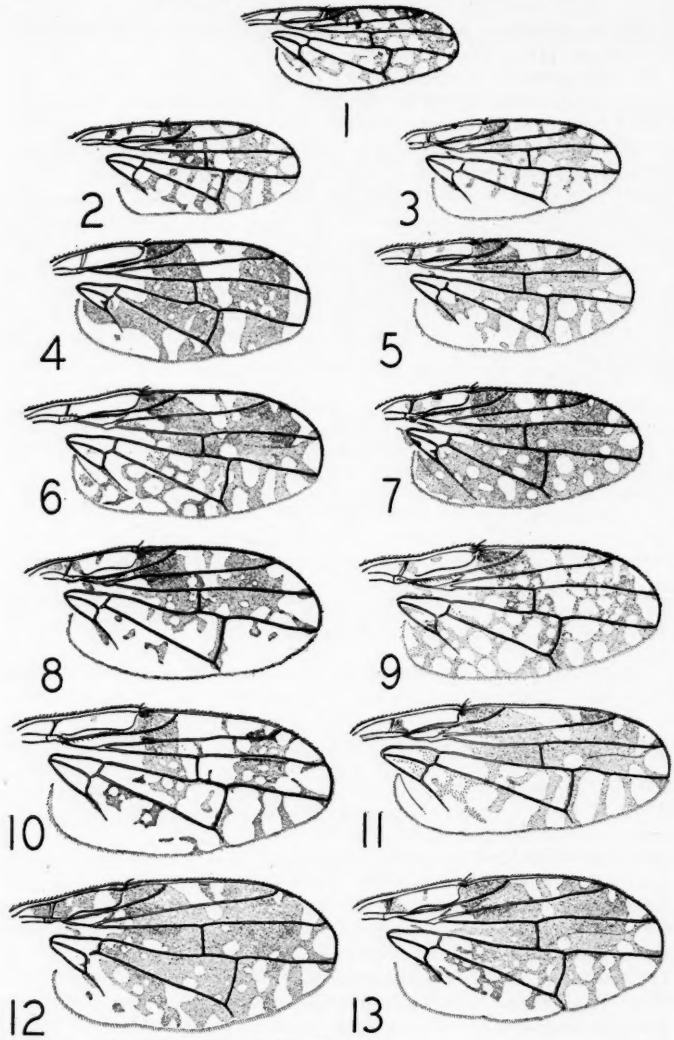
The second antennal segment is occasionally marked with black. Ocellar triangle black. Posterior pair of upper frontoorbitals dark, or whitish, variable. Humeri, notopleura and wing base often yellowish. The brownish pollen on dorsum of some of the specimens showed a tendency to form stripes as found in *pura*. Pleura with some brownish pollen distributed on posterior and upper margins of mesopleura and on pterpleura. Light yellowish or reddish yellow bands on hind margins of abdominal tergites alternates with a wholly dark condition. Coloration of the venter variable as follows: light yellowish or reddish yellow bands on posterior margins of sternites; wholly yellowish brown; each sternite with the anterior half yellowish and the posterior dark. In five of the females the ovipositor sheath is wholly brownish yellow. Length of ovipositor sheath 0.73 mm. The dark pattern of the wing varies from a slate gray to dark brown.

TYPE LOCALITY: Idaho and Minnesota.

One of the two female cotypes is in the collection at the State College of Washington, the location of the other is unknown to the author.

DISTRIBUTION: Idaho, Minnesota, Oregon, Colorado, California, Wyoming, Nevada, and New Hampshire.

HOST PLANT: Information on the label of one male Sycan Marsh, Oregon, July 20, 1931 (M. F. Canova) states that the specimen was taken from a gall in the flowerhead of goldenrod.



Explanation of plate: Wings of species of *Tephritis*.
Fig. 1, *T. arizonaensis;* Fig. 2, 5, 7, and 10, *T. araneosa;*
Fig. 3, *T. angustipennis;* Fig. 4, *T. rufipennis;*
Fig. 6, *T. subpura;* Fig. 8, *T. michiganensis;*
Fig. 9, *T. californica;* Fig. 11, *T. stigmatica;*
Fig. 12, *T. webbi,* Fig. 13, *T. pura.*

The above notes were based on seventeen specimens from the following localities: CANADA: Birch River, Shoal Lake, Deepdale, all in Manitoba. MINNESOTA: Itaska Park. OREGON: Sycan Marsh; Eagle Ridge, Klamath L. CALIFORNIA: Lone pine, Inyo County; Lakeside, Tahoe County. COLORADO: No locality given. NEVADA: Ormsby County. WYOMING: Lander. NEW HAMPSHIRE: Breton Woods. June to August.

This species is very close to *pura* and differs principally, in addition to characters given in the key, in having the costal cell with the brown pattern more extensive, and in having the brown pattern in the third posterior cell extending more closely to the posterior wing margin and usually with one or two small dark spots in addition.

Tephritis pura (Loew)

(Pl. 1, Fig. 13)

Trypeta (Euaresta) pura Loew, Smithsn. Inst. Misc. Collect., 11 (256): 320, 1873.

Euaresta pura (Loew): Cresson, Trans. Amer. Ent. Soc., 33: 105, 1907; Phillips, Jour. N. Y. Ent. Soc., 31 (3): 147, 1923; Johnson, Psyche, 16: 114, 1909.

Trupanea (Tephritoides) pura (Loew): Benjamin, U. S. Dept. Agric. Tech. Bul., (401): 59, 1934.

Tephritis pura (Loew): Hering, Siruna Seva, (5): 25, 1944.

The posterior upper frontoorbitals whitish, or dark brown, variable. The second antennal segment may be black dorsally. Dorsum of thorax with a brownish pollinose area at the scutoscutellar suture that extends onto scutellum, and emits five rather indistinct rays anteriorly as follows: one on either side beginning at about a point in line with the posterior dorsocentral and extending to transeverse suture; one on either side that passes over the anterior dorsocentrals and terminates about midway between transverse suture and anterior margin; and one median one extending to anterior margin. Pleura brownish pollinose as follows: a spot on upper half of mesopleura that tapers ventrally to a narrow stripe on posterior border; whole of pteropleura; a small spot bordering upper margin of sternopleura. Posterior border of apical abdominal segment reddish yellow the posterior border of the remaining segments inconspicuously marked the same. Venter varys between a pale yellowish brown and an almost wholly dark color. Length of ovipositor sheath 0.70 mm.

TYPE LOCALITY: Massachusetts.

Type, female, in the Museum of Comparative Zoology.

DISTRIBUTION: Massachusetts; New York; Virginia.

HOST PLANT: Unknown.

It is doubtful if the pair of headless specimens discussed by Cresson (1907) are *pura* since the figure given in his paper shows considerable brownish markings in the lower half of the third posterior cell and the broad brown band extending posteriorly from the stigma originates on the costa beyond the apex of the first longitudinal vein. The figure given by Cresson seems to agree more nearly with that of a specimen from Jemez Springs, New Mexico (Pl. 1, Fig 5) and placed here in the *araneosa* complex.

The above notes were based on ten specimens from the following localities: CANADA: Birch River, Manitoba. FLORIDA: No locality given.

MAINE: No locality given. MARYLAND: Takoma Park. MASSACHUSETTS: No locality given. MINNESOTA: Bena. VIRGINIA: Vienna. May to August.

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A NEW METROBATES FROM BRAZIL, SOUTH AMERICA (HEMIPTERA-GERRIDAE)

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Nine described species of the genus *Metrobates* Uhler are known. Only one of them is from South America which is *Metrobates fugientis* D.& H., described from Tingo Maria, Peru. The Francis Huntington Snow Collections at the University of Kansas contains two males and three females of this species labeled: "Peru, S.A., Oct. 11-22-1936, F. Woytkowski, Dept. San Martin Vic. Rioja Jungle 900 m. a.s. 1", all winged with wing membranes broken off, and one apterous male labeled "Bolivia, S.A.R. Chapare, March 1938, road between Todos Santos and Palmer."

The species described below adds a second South American species.

Metrobates plaumanni

Size: Apterous males: length 3.78 mm. to 4.2 mm.; greatest width 1.72 mm. to 1.89 mm. Apterous females: length 3.78 mm. to 4.28 mm. greatest width 2.22 mm. to 2.31 mm. Winged forms all have the wings broken off, exposing last four abdominal segments. The single winged male is 4.4 mm. long and 1.93 mm. in greatest width. The winged females, 4.2 mm. to 4.4 mm. long; greatest width 2.22 mm. to 2.31 mm.

Color: Wingless forms. General color gray and black with dark brown mark on head and light brown to gray spot on pronotum. Antenna black with basal one-fourth to one-third of first segment brown to yellow. Beak and legs black except base of front femur which is brown to yellow. Head black

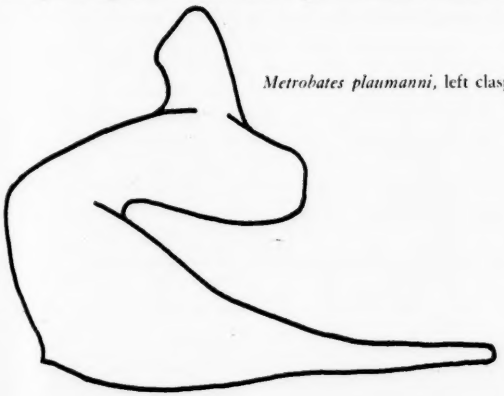
*Contribution No. 769 from the Department of Entomology, University of Kansas, Lawrence

except for a dark brown V-shaped mark on the vertex. Pronotum black with a median light brown to gray spot that is usually quadrate in shape but broader in front. This spot may be nearly heart-shaped or even triangular. Mesonotum black with a median longitudinal gray band that does not reach either the front or rear margins of the segment and is divided by a slender black longitudinal median line. A gray longitudinal lateral band extends the length of the segment. There are gray bands on the abdominal segments and some gray on the acetabula. The winged forms, black above with the pronotal spot triangular.

Structural characteristics: Mesosternum of apterous forms not divided by a longitudinal median suture and in the males quite densely covered with long silvery to faintly golden hairs. The winged forms have two nearly parallel longitudinal lines on the mesosternum as do the winged forms of *M. denticornis* (Champ.), *M. artus* Anderson, *M. fugientis* D.& H., etc. but lack the median sutural line characteristic of these species. Front femur and mesosternum of male unarmed. The antennal formula: Male: 1st : 2nd : 3rd : 4th :: 86 : 40 : 25 : 17; female: 1st: 2nd : 3rd : 4th :: 62 : 26 : 19 : 18. The pronotum of apterous forms short, lateral margins angulate, and the median brown or gray spot depressed. The connexivium of male vertical and its genital segments long, as long as the abdomen. The male claspers long and slender on distal half as shown in text figure. The female genital segment as wide as the rear margin of the last abdominal segment.

Location of types: Holotype male, allotype female, 11 paratype males, 15 paratype females labeled "New Teutonia, Brazil, XII, 1948, 27°11′ B. 52°23′ L. Fritz Plaumann." Two paratype males, 1 paratype female, "Nova Teutonia, Brazil, XI-22, 1948, 27°11′ B. 52°23′ L. Fritz Plaumann." All the above are apterous. The morphotype series consists of the male holomorphotype, female allomorphotype and 10 paramorphotypes, all females, taken at same place at the apterous forms. In the Francis Huntington Snow Collections, University of Kansas.

Comparative notes: This species, since it lacks the median longitudinal suture on the mesosternum, would run out with *M. hesperius* Uhler in Anderson's key (Univ. of Kans. Sci. Bull. XX, p. 302, 1932). It differs from *M. hesperius* Uhler and all other known species of Metrobates in the Americas by having the last antennal segment shorter than the third.



Metrobates plaumanni, left clasper of male.

A MONOGRAPHIC STUDY OF THE AFRICAN BIBIONIDAE (Diptera)

Part II: Genus *Philia* Meigen

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University of Hawaii

Philia Meigen, 1800, Nouv. Class. Mouch., 20.
Dilophus Meigen, 1803, Illiger's Mag., 1, vol. 2:269.
Acanthocnemis Blanchard, 1852, C. Gay, Hist. fis. polit. Chile, Zool. 7:355.
Cnemidoctenia Enderlein, 1934, S. B. Ges. Naturf. Fr. Berl., 181.
Dactylodiscia Enderlein, 1934, Ibid, 181.
Tridicroctena Enderlein, 1934, Ibid, 181.
Triploctenia Enderlein, 1934, Ibid, 181.

The four above cited Enderlein names have been discussed in the writer's "The Argentine Bibionidae" which is now in press. Enderlein's names were based upon *Dilophus crassicrus* Lund., *D. hiemalis* Becker, *D. africanus* Becker and *D. tenuis* Meigen respectively; all except the latter are African species. As has been pointed out in the above mentioned paper, the number and arrangement of the tibial spines are very important as specific characters but the writer does not consider them to be of generic importance. In the treatment of *Philia,* especially from a world standpoint, it certainly would not be practical to break the group down, even to subgenera, on the bases of the tibial spines.

The genus *Philia* is moderately well presented in the African region. Nineteen species are recognized in this present study. Some of these are poorly known and their exact status is not clearly understood.

Genotype: *Tipula febrilis* Linnaeus.

Key to the African Philia

1. Front tibiae each with just one set (row) of spines above the apical set 11
   Front tibiae bearing two or three sets of spines above the apical set, or a single spine is located near the middle of the segment with a set of two or more spines situated above the middle; two rows of spines are sometimes situated close together near the middle of the tibiae as in *vicaria* Hardy 2
2. Front tibiae with three sets of double spines above apical set ..... (Tripoli)..... *tridentata* (Walker)
   Only two sets of spines above apical set or with just a single spine at the middle of the segment and two to three spines near base of tibiae 3
3. Just a single spine at the middle of the segment and a row of two to three spines above, at the basal one-fourth to one-third of the tibiae 4
   Two or more spines situated near the middle of the front tibiae..... 5

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4. Front tibiae with two spines in the top set (fig. 7a) (Central Africa) ..... *nupta* Speiser
With 3 spines in the top set (Tunis) ..... *brevifemur* (Lundström)

5. The rostrum (sclerotized portion of the face) elongate, the portion beyond the bases of the antennae is about as long or longer than the compound eyes and in some it is longer than the head 6
Rostrum short, scarcely if at all produced beyond bases of antennae..... 8

6. Three strong spines in the middle set on the front tibiae; halteres black (Tunisia) ..... *lingens* (Loew)
Just two spines in middle set; halteres yellowish to whitish 7

7. Spines of the first (top) set on the front tibiae large, well defined and situated at the extreme base of the tibiae; hind metatarsi of males not thickened (Egypt) ..... *africana* (Becker)
Spines of first set very small, scarcely differentiated into teeth, located at the basal third of the segment; hind metatarsi and apices of hind tibiae of male strongly swollen (Canary Islands) ..... *hiemalis* (Becker)

8. Front tibiae short and broad, only about four times longer than wide; all of the spines above the apical set are located near the middle of the tibiae; three spines are situated in an irregular row at middle and one large and one small spine are at the apical two-thirds of the segment (fig. 4a) .....(Tunis)..... *crassicra* (Lundström)
Front tibiae eight or more times longer than wide; spines not as above....9

9. The tibial spines all arranged at or slightly before the middle of the segment and grouped close together; pile yellow (Uganda) ..... *vicaria* Hardy
First set of tibial spines located near the basal fourth of the segment and well separated from the middle set; pile black 10

10. Front coxae and femora yellow; hind tarsi strongly swollen (fig. 7d); spines in the two sets (not counting apical set) on the front tibiae usually equal in size (Central Africa) ..... *nupta* Speiser
Legs entirely black; hind tarsi not swollen; spines of front tibiae unequal, in each set one is larger and longer than the other (Egypt) .... *aegyptia* (Costa)

11. Costa and anterior veins of the wings very pale to colorless; stigma colored only in some females 12
Costa and anterior veins dark brown to black; stigma distinct except in some specimens of *femorata* (Meigen) 15

12. Costa ending at or very near the apex of the radial sector ..... (widespread distribution) ..... *erythraea* (Bezzi)
Costa extending well beyond the apex of the radial sector, about one-third to one-half the distance to vein M_{1+2}..... 13

13. Vein M_{3+4} incomplete, ending well before the wing margin; ninth tergum of male gently concave on the hind margin; male claspers rather square at apices (fig. 8b) (South Africa) ..... *obsoleta* n. sp.
Vein M_{3+4} complete, reaching wing margin (even though faint); male genitalia not as above 14

14. Knobs of halteres black; stigma distinct brown; head of female black, longer than wide; ninth tergum of male straight on the hind margin, claspers pointed at apices. (Uganda) ..... *lucida* Hardy
Knobs of halteres yellow-white; stigma very faint or lacking; head of female reddish and as wide as long (East Africa) ..... *disagra* Speiser

15. Male 16
Females 24

16. Halteres yellow-white; coxae and femora reddish yellow.....
(East Africa) ..... *disagra* Speiser
Halteres black; legs usually all black 17

17. Rostrum (sclerotized portion of the face beyond eyes) produced about one-half to almost equal in length to the lower portion of the compound eye 18
Rostrum not at all produced, not extending beyond bases of antennae or scarcely beyond the eye margin 21

18. Pile of thorax and legs black 19
Pile all whitish 20

19. Wings hyaline; eyes densely pilose (Kenya) ..... *atrimas* (Edwards)
Wings dark brown fumose; eyes sparsely haired (South Africa) .....
..... *splendens* n. sp.

20. Wings milky white; posterior veins colorless .....(South Africa)
..... *capensis* (Edwards)
Wings lightly fumose; posterior veins pale brown .....(Kenya)
..... *suberythraea* (Edwards)

21. Front tibiae with only two or three small spines at the middle.....
(Canary Islands) ..... *beckeri* Hardy
Front tibiae with four teeth in the middle; wings usually hyaline.....22

22. Wings dark brown fumose (South Africa) ..... *splendens* n. sp.
Wings hyaline to faintly fumose 23

23. Wings slightly milky white; posterior veins colorless; stigma small, faintly fumose or hyaline; pile of hind metatarsi short, not longer than the width of the segment (North Africa) ..... *femorata* (Meigen)
Wings hyaline or lightly fumose; stigma large and dark brown; posterior veins lightly colored; pile on dorsal surface of hind metatarsi two to three times longer than the width of the segment .....
(North Africa) ..... *antipedalis* (Wiedemann)

24. Head elongated, two or more times longer than wide from a dorsal view; rostrum about equal in length to the eyes and distinctly produced beyond the antennal bases 25
Head scarcely longer than wide; rostrum not developed beyond bases of the antennae and not over one-half as long as the eyes 29

25. Thorax entirely shining black; middle and hind coxae black, all femora chiefly so, rufous only at bases and apices .....(Kenya)
..... *atrimas* (Edwards)
Femora, coxae and at least sides of prothorax rufous 26

26. Wings dark brown; larger species, 6.5 - 7.0 mm. long; thorax often entirely brownish red 28
Wings very faintly fumose; smaller species, 4.0-4.5 mm.; mesonotum chiefly black 27

27. Sides of mesonotum and all of pleura yellow-red; femora dark tipped; venter of abdomen yellowish ....(Kenya)....*suberythraea* (Edwards)
Only the propleura and sides of the pronotum are yellow-red, thorax otherwise black; femora all rufous; venter black .....(South Africa) .....*capensis* (Edwards)

28. Thorax entirely bright red; pile all black; abdomen black..... (South Africa) .....*splendens* n. sp
Pronotum, median part of mesonotum, scutellum and metanotum black; pile all pale; abdomen yellowish tinged (South Africa) .....*bicolor* (Wiedemann)

29. Thorax chiefly rufous, except for black scutellum and mesonotal combs or an abbreviated black mark extending part way down the back; femora all rufous 30
Thorax shining black, except for the reddish colored humeri; femora often marked with black 32

30. Wings hyaline or nearly so; thorax with an abbreviated black line down the dorsum; front tibiae with four spines on the middle of the segment 31
Wings yellow-brown fumose; mesonotum entirely rufous except for the black combs; sometimes only three spines in the middle of the front tibiae .....(Canary Islands).....*beckeri* Hardy

31. Vein M_{3+4} incomplete, ending well before the wing margin, costa extending about one-third the distance between the tips of the radial vein and M_{1+2}; halteres yellowish, with a slight tinge of brown..... (some specimens run here) (South Africa) .....*obsoleta* n. sp.
Vein M_{3+4} extending to wing margin; costa extending half way to M_{1+2}; halteres with black knobs .....(some specimens run here) (Uganda .....*lucida* Hardy

32. Wings hyaline or but slightly yellowish fumose; smaller species 4.0-5.0 mm. 33
Wings dark yellow-brown fumose; large species, 7.2 mm. ..... (Uganda) .....*buxtoni* Hardy

33. Wings slightly milky white, posterior veins colorless; stigma rather small (North Africa) .....*femorata* (Meigen)
Wings faintly yellowish, posterior veins brownish; stigma large..... (Northern Africa) .....*antipedalis* (Wiedemann)

Philia aegyptia (Costa)

Dilophus aegyptius Costa, 1875, Atti Acad. Napoli, 7:15.

This species appears to be most closely related to *Philia nupta* Speiser and differs by having the spines of the front tibiae differently arranged; by having the legs entirely black and the hind tarsi not swollen. Costa said *aegyptia* is

similar to *vulgaris* (Meigen) but that the tibial spines are different in development. It is distinguished from *africana* (Becker) by the dark halteres, the black thoracic pile, and the unequal tibial spines.

The following notes are taken from the original description and from Becker.[2]

Chiefly or entirely black species, colored as in *vulgaris* (Meigen). Front tibiae with three sets of spines. The sets above the apex of the tibiae each have two unequal spines, one is larger and longer than the other. The first set of spines is located near the base of the tibia and the second set is just beyond the middle. The rostrum is short, developed but very little beyond the eye margin. The wings are yellowish fumose in the male and blackish fumose in the female. The stigmata are brown and well defined. The halteres are brownish black. The pile of the thorax is black.

Length: Body, 4.5-5.0 mm.

Type locality: Egypt.

Type possibly in the Zool. Univ. Mus. Neapel.

The writer has not seen this species.

Philia africana (Becker)

Dilophus africanus Becker, 1903, Mitt. Zool. Mus. Berl., 2:79.

Becker allies this species to *Philia aegyptia* (Costa). It differs from this species by having the halteres yellowish white, the rostrum elongated, the thoracic pile pale and the tibial spines equal in size. It appears to be more closely related to *Philia hiemalis* (Becker). It is distinguished from this species by having the first set of tibial spines located near the base of the segment and by having the hind metatarsi of males not thickened.

The following notes are from the original description and from Duda[3].

Male. Head: Antennae and palpi black. Rostrum elongated, about three-fourths as long as the eyes and equal in length to the lower portion of the eye (set off by the smaller facets). *Thorax:* Polished black with fine whitish pile. Halteres white, the stems black at bases. *Legs:* Entirely shining black, with sparse pale pile. Femora and tibiae not strongly thickened. Front and middle tarsi very slender, hind tarsi somewhat thicker but not greatly swollen. Front tibiae each with two sets of large equally developed spines above the apical set, the first set is located near the base of the segment and the second is near the middle. *Wings*: Nearly colorless, very slightly brownish fumose. Stigmata yellow-brown in color.

Length: body, 4.5-5.0 mm.

Female: The tibial spines are much stronger than in the male and the front coxae, femora and abdomen are tinged with reddish brown.

Type locality: Luxor, Egypt.

Type in the Zoologisches Museum der Universitat Berlin.

The writer has not seen this species.

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[2] 1903, Mitt. Zool. Mus. Berl., 2:79.

[3] 1930, Die Flieg, der Pal. Reg. 2, (4):25.

Philia antipedalis (Wiedemann)

Dilophus antipedalis Wiedemann, 1818, Syst. Beschr. Eur. Zweifl., 1:308.
Dilophus femoratus var. *andalusiacus* Strobl, 1900, Wien. Ent. Zeitg., 19:92.

This species is related to *Philia femorata* (Meigen) and is distinguished by the faintly yellowish fumose wings, the colored posterior veins, the distinct stigmata and the longer pile on the hind tarsi.

Specimens at hand from East Africa cannot be separated from *antipedalis* and are apparently that species. This is obviously the same species which Edwards recorded from Uganda[4] which he said agreed "generally with *atrimas* Edwards but has darker wings and yellowish hairs on the thorax." The specimens herein described are slightly larger than those which have been recorded from Europe and the posterior veins of the wing are apparently darker.

Male. Entirely polished black, all pile pale yellow, except on head. *Head*: Eyes, face and occiput densely covered with long black pile. Sclerotized portion of face beyond eyes very short, not developed beyond bases of antennae. Antennae ten segmented. *Legs*: The front tibiae possess two sets of dark red spines, one set composed of four strong spines in an oblique row is located near the middle of each tibia; the spines of the apical set are rather blunt. The hind femora are swollen but not greatly enlarged. The hind tibiae are rather slender and are nearly equal in length to the femora. Tarsal subsegments slender, the basitarsi are about six times longer than wide and not quite equal in length to the next two subsegments. All leg segments with an abundance of long pile. The long hairs on the top edge of the hind metatarsi are about two times longer than the width of the segment. *Wings*: Faintly yellowish brown fumose. Stigmata and anterior veins dark brown, posteriors light yellowish brown. Costa extending to about half way between the tips of veins R_s and M_1. *Genitalia*: Very similar to that of *P. suberythraea* (Edwards). The ninth tergum is very slightly concave on the hind margin and is about one and one-half times as wide as long. The ninth sternum is cleft about one-third its length and the claspers are short, thick and rounded apically (as in fig. 10b).

Length: body, 4.0-5.0 mm.; wings, 3.8-5.6 mm.

The length of the European specimens has been recorded as 3.0-3.5 mm.

Female. *Head*: Just slightly longer than wide from a dorsal view, pile yellow. *Thorax*: Chiefly black, pleura tinged with yellow-brown. Coxae and femora red, the latter with narrow dark tips. Tibiae yellowish brown, the hind pair sometimes all yellowish. Tarsi dark brown to blackish. Otherwise like the male except for genital characters.

Type locality: Portugal.

Type in the Zoologisches Museum der Universitat Berlin.

The specimens the writer has studied were from the following localities: Kenya, Mt. Elgon, Alpine Zone, 12-13,000 ft., on *Lobella elongonensis* Feb., 1934 (F. W. Edwards); Kenya, Mt. Elgon, Heath Zone, 10,500-11,500 ft., February, 1935 (F. W. Edwards); Kenya, Aberdare Range, Mt. Kinangop, 12,000 ft., October, 1934 (F. W. Edwards) and Mt. Mlanje, Nyasaland, August 22, 1913 (S. A. Neave).

[4] 1912, Voy, de Ch. Alluaud et R. Jeannel en Afrique Orientale, 2:63.

Philia atrimas (Edwards)

Dilophus atrimas Edwards, 1915, Voy. Alluaud., Dipt. :61.

This species appears to be most closely related to *Philia splendens* n. sp., but is distinguished by its hyaline wings and by the densely pilose eyes of the male. The females differ by having the thorax shining black instead of bright red.

The following notes are from the original description.

Male. Entirely shining black except for the reddish tibial spurs and eyes. Pubescence of head, thorax and legs very long and dense, that of abdomen shorter. Pile of head, thorax and femora black; that of abdomen, tibiae and tarsi whitish. *Legs*: Front tibiae each with four spines (occasionally only three) arranged in a nearly transverse row near the middle and with seven to nine spines at the apex. Front femora a little longer than the coxae; the front tibiae are considerably longer than the femora. Hind femora and tibiae about equal in length. *Wings*: Clear, stigmata blackish and well defined. Anterior veins dark brown, posteriors light brown. Crossvein m-cu placed at or slightly beyond the fork of Media.

Length: body, 4.5 mm.; wings, 5.6 mm.

Female: Head and thorax shining black, abdomen brownish black. Legs largely black, except that the front coxae are reddish and all femora are reddish except at bases and extreme apices. All pubescence whitish, that on head, thorax and legs much shorter and more sparse than in male. Head longer than in male, the eyes are less than half as long as the head, excluding the mouthparts. The rostrum is nearly as long as the eyes. Tibial spines a little larger than in the males and the posterior veins of the wings are a little darker.

Type locality: British E. Africa, Mt. Kenya.

Type in British Museum (Natural History).

The writer has not seen this species.

Philia beckeri Hardy

Philia beckeri Hardy, 1948, Journ. Kans. Ent. Soc., 21(1):36.
Change of name for *Philia minor* (Becker), 1908, Mitt. Zool. Mus. Berl, 4:60 nec *Philia minor* (Strobl), 1900.

This species is related to *Philia bicolor* (Wiedemann) but is scarcely half as large, the head is not elongated and the front tibiae of the males have just two to three spines in the middle set.

The following notes are from the original description.

Male. Head: Rostrum short, not prolonged. *Thorax and abdomen*: Polished black with yellow pile. Halteres brownish black. *Legs*: Entirely black, with pale pile. Tarsi slender, not thickened. Front tibiae with two to three spines in the middle. *Wings*: Somewhat yellow-brown fumose, stigmata dark brown. Posterior veins pale yellowish brown.

Female. Thorax polished reddish yellow, with black combs and scutellum similar to *P. bicolor*. Abdomen polished peach-brown. Coxae and femora

yellow, tibiae and tarsi brownish black. Front tibiae each with three to four short spines in the middle.

Length: body, 2.5-3.5 mm.

Type locality: Canary Islands.

Type in the Zoologisches Museum der Universitat Berlin.

The writer has not seen this species.

Philia bicolor (Wiedemann)

(Fig. 1a)

Dilophus bicolor Wiedemann, 1821, Dipt. exot., 1:34.

This species is related to *Philia splendens* n. sp., and is distinguished by the more elongate rostrum; by the black markings on the thorax of the female; by the all pale pile of head and body; by the yellowish brown color of the female abdomen and the longer costa of the wing.

Female. All pile yellowish, except for the black pilose tibiae and tarsi. *Head*: Slightly over two times longer than wide from a dorsal view. From a lateral view the sclerotized portion of the face beyond the eyes is prolonged and equal in length to the eyes; the sclerotized portion beyond the antennal bases is equal in length to that part of the face from the antennae to the eye margins (fig. 1a). The extended mouthparts are as long as the head. Ocelli not placed on a well defined tubercle. Front finely rugulose, not at all pruinose. Antennae eleven segmented. *Thorax*: Pleura, sides of notum and underpart of scutellum reddish yellow. Dorsum with a shining black median line, top of scutellum and metanotum black. Knobs of halteres black, stems brownish yellow. *Legs*: Coxae, trochanters and femora rufous, tibiae and tarsi black. Front tibiae each with a row of strong spines just above the middle and nine blunt spines in the apical set. *Wings*: Dark brown fumose, stigmata very dark brown to black. Costal vein extending slightly more than one-third the distance between the tips of R_s and M_1. *Abdomen*: Chiefly brownish with a distinct yellowish tinge.

Length: body, 6.0-7.0 mm.; wings, 6.0-6.8 mm.

Male unknown.

Type locality: Cape of Good Hope.

Type in the Universitetes Zoologiske Museum, Copenhagen.

The writer has studied a female specimen from Cape Province, Robertson Pass, near Mossel Bay, 2,000 ft., September, 1932 (R. E. Turner).

Philia brevifemur (Lundström)

(Fig. 2a)

Dilophus brevifemur Lundström, 1913, Ann. Mus. Nat. Hung., 11:394-395.

This species appears to be related to *P. nupta* and is distinguished by having three spines in the set above the apex on each of the front tibiae. Lundström allied the species to *febrilis* L. and distinguishes it by male genital characters, and by the shorter, more thinly haired legs. The front femora of *brevifemur* are shorter than the tibiae, they are equal to slightly longer than the tibiae in *febrilis*.

The following notes are from the original description.

Male. Entirely shining black species, except for the dark reddish brown front femora. *Legs*: Front tibiae each with three strong spines, in a slightly oblique row, situated at the basal third of the segment and just a single spine located at the middle of the tibia. *Wings*: Hyaline, the anterior veins somewhat yellowish, the posterior veins are colorless. *Genitalia*: The ninth tergum appears to be almost as wide as long and its hind margin is very slightly concave. The claspers are much more slender than in *febrilis* and are slightly pointed at apices (fig. 2a).

Length: body, 3.0-4.0 mm.

Female unknown.

Type locality: Budapest, Hungary.

Type probably in the Zoological Museum, University of Helsingfors, Finland.

The species has also been recorded from Tunis. The writer has not seen this species.

Philia buxtoni Hardy

Philia buxtoni Hardy 1948, Brit. Mus. (Nat. Hist.) Ruwenzori Exped., 1934-'35, 1(6): 123-124.

This species is related to *Philia femorata* (Meigen) and to *P. antipedalis* (Wiedemann). It is distinguished by its dark yellow-brown fumose wings and its much larger size. *P. buxtoni* was adequately treated in the original description.

Length: body, 7.2 mm.; wings, 8.0 mm.

Type locality: Nyamgasani Valley, Uganda, Ruwenzori Range.

Type in the British Museum (Natural History).

Philia capensis (Edwards)

(Fig. 3a)

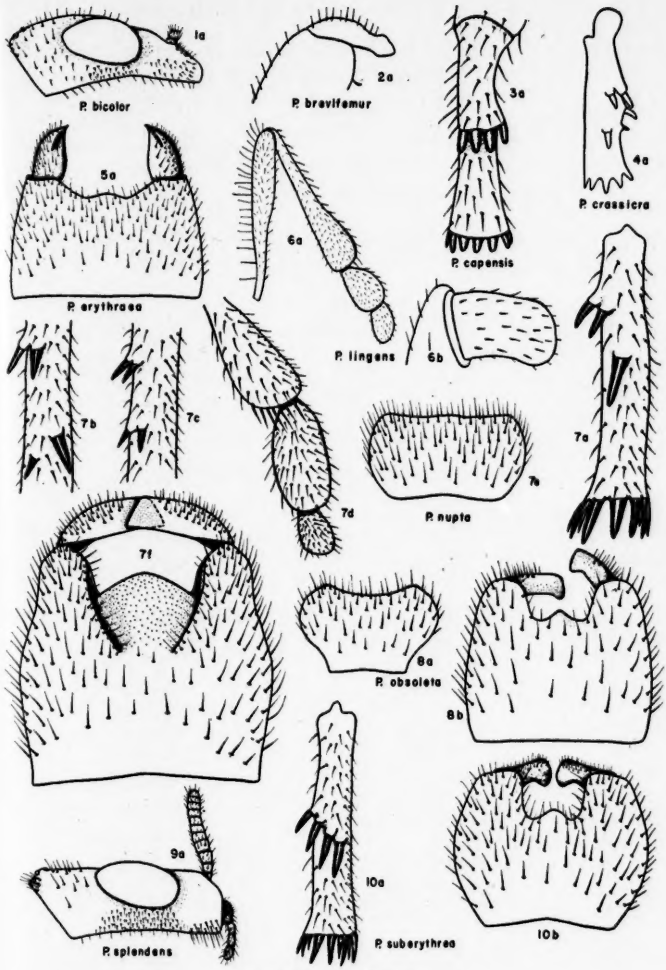
Dilophus capensis Edwards, 1925, Ann. So. Afr. Mus., 19:615.

This species apparently is very close to *Philia suberythraea* (Edwards). The males are distinguished by having the wings milky white and the posterior veins concolorous with the membrane. The females differ by having the mesonotum, the venter of abdomen and most of the pleura, except the propleura, black, and by having the femora all rufous.

The following notes on the male are from the original description.

Male. Entirely shining black species, rather sparsely whitish pilose. *Head*: Eyes sparsely haired. Labium slender, longer than the head when fully extended. *Legs*: Front tibiae each with a rather irregular and oblique row of four spines slightly beyond the middle. The front tibiae have eight to nine spines in the apical set. The hind tibiae and tarsi are slender, the basitarsi are nearly two times longer than the second subsegments. *Wings*: Milky white, stigmata conspicuous and dark brown; costal cell also darkened. Anterior veins dark brown, posteriors milky white. Venation as in *febrilis*. Halteres with brownish stems and black knobs.

Female. *Head*: Shining black, about two times longer than wide from a dorsal view. The rostrum is produced well beyond the bases of the antennae and is equal in length to one eye. The ocellar tubercle is very inconspicuous,



Explanation of Figures

1. *Philia bicolor* (Wiedemann). a. head of female, lateral view, antennae and mouthparts not shown.
2. *P. brevifemur* (Lundström), a. clasper of male genitalia, diagramatic view copied from Lundström, 1913.
3. *P. capensis* (Edwards). a. front tibia of female.
4. *P. crassicra* (Lundström). a. front tibia, copied from Lundström, 1913.
5. *P. erythraea* (Bezzi). a. male genitalia, ventral view.
6. *P. lingens* (Loew). a. hind leg of male, copied from Duda, 1930; b. clasper of male genitalia, diagramatic view copied from Lundström, 1913.
7. *P. nupta* Speiser. a. front tibia of male, typical; b and c. front tibiae, atypical; d. hind metatarsus of male; e. ninth tergum of male; f. male genitalia, ventral view.
8. *P. obsoleta* n. sp. a. ninth tergum of male; b. male genitalia, ventral.
9. *P. splendens* n. sp. a. head of female, lateral view.
10. *P. suberythrea* (Edwards). a. front tibia of male; b. male genitalia, ventral.

the ocelli are scarcely raised above the head level; the tubercle is only as high as one ocellus. Eyes bare, remainder of head sparsely yellow pilose.

Thorax: Chiefly shining black with only propleura and sides of pronotum yellow-red. A female specimen on hand from Natal has the thorax entirely rufous. *Legs*: Coxae and femora yellow-red; tibiae and trochanters brownish with a rufous tinge; tarsi chiefly blackish. Front tibiae with the four spines thicker and stouter than in the male and placed slightly before the middle of each tibia (fig. 3a). Front coxae very large, longer and stouter than the femora. *Wings*: With the stigmata larger and darker than in the males.

Length: body, 4.0 mm.-4.5 mm.; wings, 3.5 mm.-4.0 mm.

Type locality: Cape Town.

Type in the British Museum (Natural History).

The writer has identified this species from: Camps Bay, Cape Penninsula, So. Afr., Sept. 1920 (R. E. Turner) and E. Cape Prov., Katberg, 4,000 ft., Oct. 1922 (R. E. Turner); Ulundi, Natal, 5,000-6,500 ft., Sept. 1896 (G. A. K. Marshall). Banhoek Valley, Stellenbosch Div., Oct. 1934 and Stellenbosch, Oct. 1917 (Lightfoot).

Philia crassicra (Lundström)

(Fig. 4a)

Dilophus crassicrus Lundström, 1913, Ann. Mus. Nat. Hung., 11:394.

This species appears somewhat related to *Philia nupta* Speiser but the shorter, more thick front tibiae and the difference in the arrangement of the tibial spines will distinguish it. The following notes are from the original description.

Female. Head: Black, with black pile. Eyes about half as long as the head. Rostrum short, antennae inserted right in front of eyes. Scape and pedicel of antennae yellowish. *Thorax*: Mesonotum chiefly polished black, humeri and side margins of mesonotum reddish yellow. Pleura and scutellum blackish brown. Metanotum and halteres black. *Legs*: Reddish yellow. The tibiae and tarsi blackish brown. Front tibiae broad and short, each with an irregular row of three black spines on the middle, and below this set with one large spine on the inner side and one small spine on the outer side (fig. 4a). *Wings*: Almost hyaline, stigmata large and dark brown in color. Anterior veins dark brown, posteriors pale yellowish.

Length: body, 4.0 mm.-4.5 mm.

Male unknown.

Type locality; Tunis.

Type probably in the Zoological Museum, University of Helsingfors.

The writer has not seen this species.

(To be continued in next issue)

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